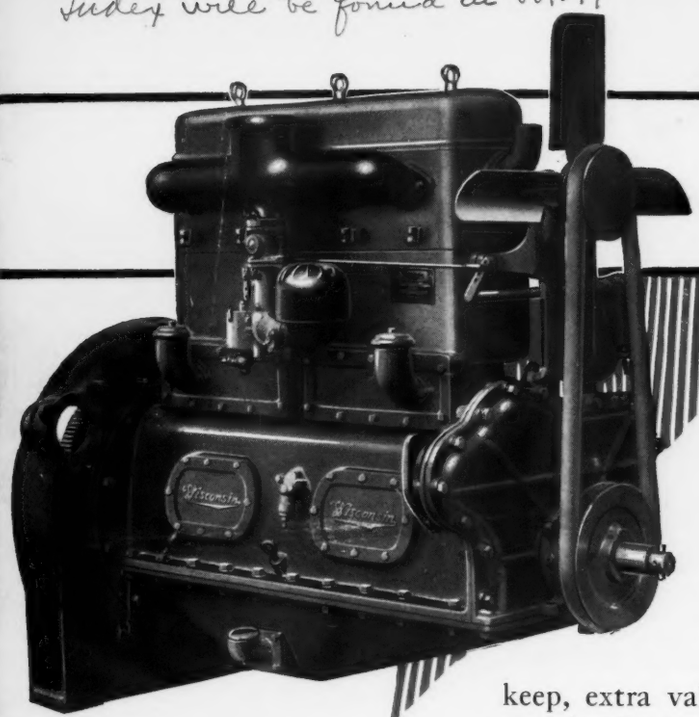
Pit and Quarry

SAND-GRAVEL-STONE
CEMENT-LIME-GYPSUM

Index will be found in vol. 19



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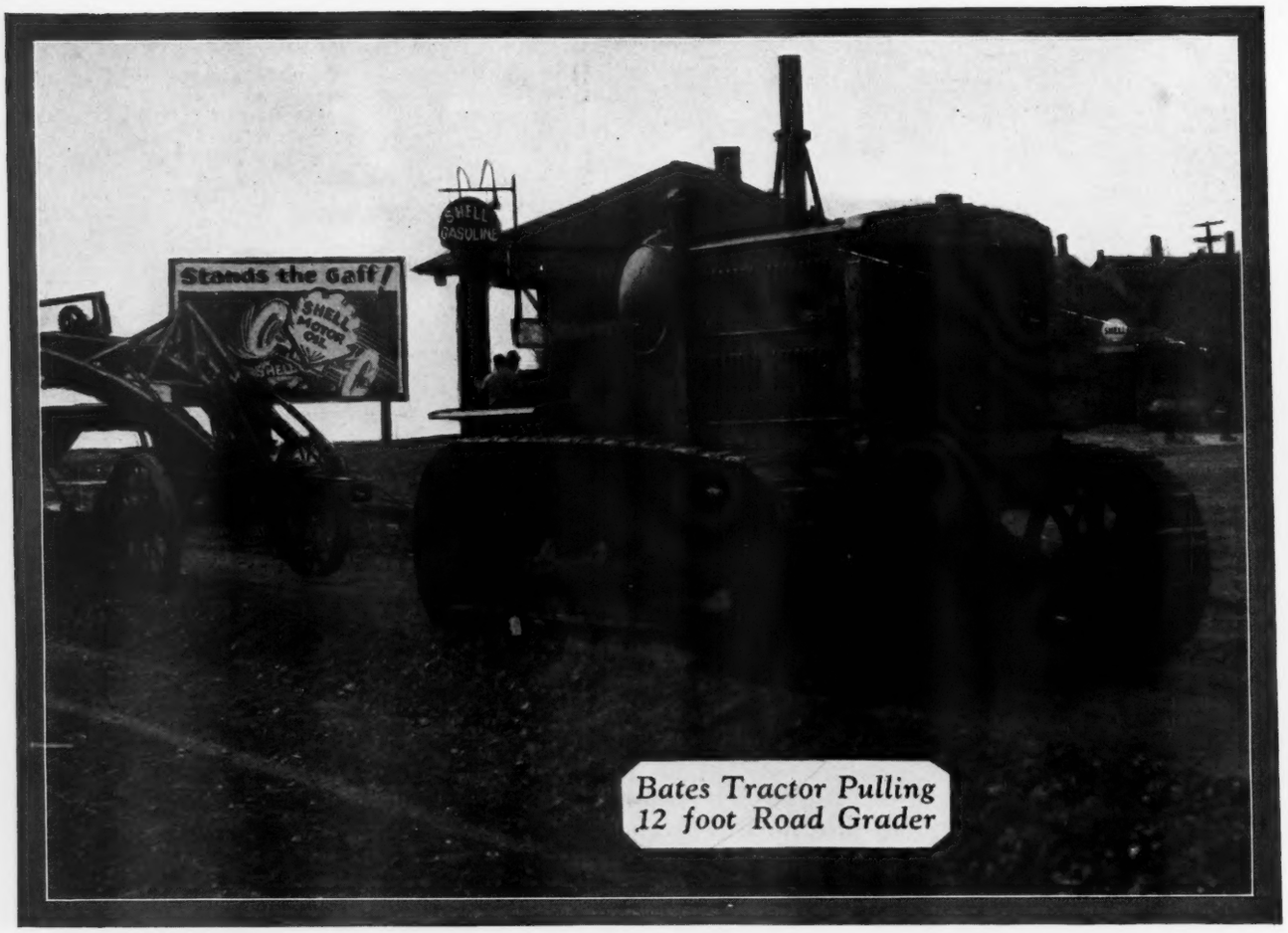

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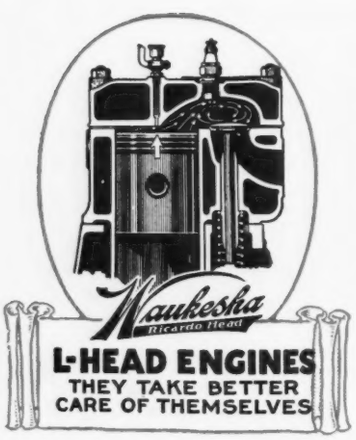

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931

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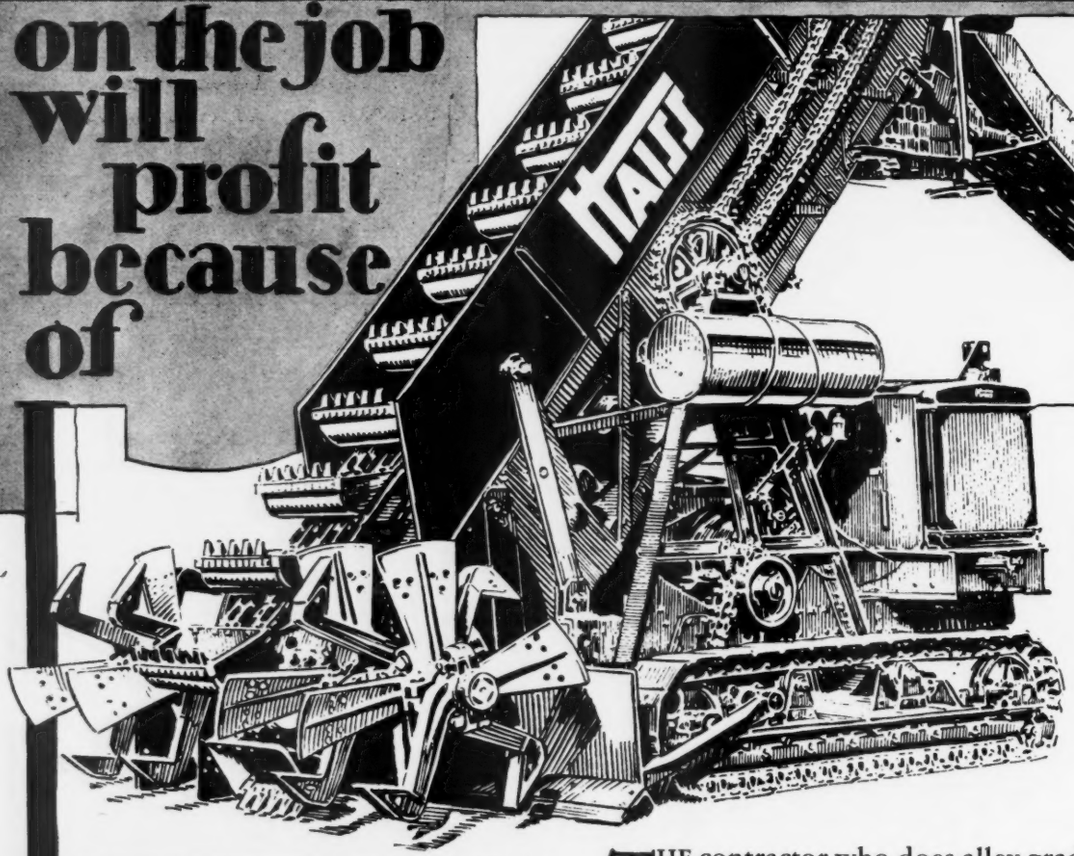

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Pit and Quarry

Vol. XVIII CHICAGO, ILL., APRIL 10, 1929 No. 1

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is taken from our files and its selection is without significance as to current events or as to the position of the individual in the industry.

V. J. Sloan

Mr. Sloan is Secretary-Treasurer
of the Universal Granite Quarries Company,
of Chicago, Illinois

Muscle Shoals White Lime Company Distributes Over Wide Area

By W. E. TRAUFFER
Assistant Editor, Pit and Quarry

THE Muscle Shoals White Lime Company operates a one-kiln plant near Cherokee, in the picturesque country of northwestern Alabama along the Tennessee River. This plant is of interest because it is one of the few operating plants in that section of the country and because of the wide territory in which its product is marketed, some being sold even in sections in which lime plants abound.

The rock deposit has a high calcium content which makes it suitable both for lime and for steel-mill flux. The content as determined by various testing laboratories is as follows:

Silica	0.45 per cent
Alumina	0.16 per cent
Iron oxide	0.14 per cent
Calcium oxide	98.50 per cent
Magnesia	0.65 per cent

The causticity of the lime averages 90.2 and the settling time is 4½ minutes. The lime is snow-white when slacked. It slacks easily and has a high putty yield. It is used mostly for building construction, in paper mills, and for agricultural purposes.

H. D. LeCroy Beside Plymouth Locomotive

Locomotive and Cars at Quarry

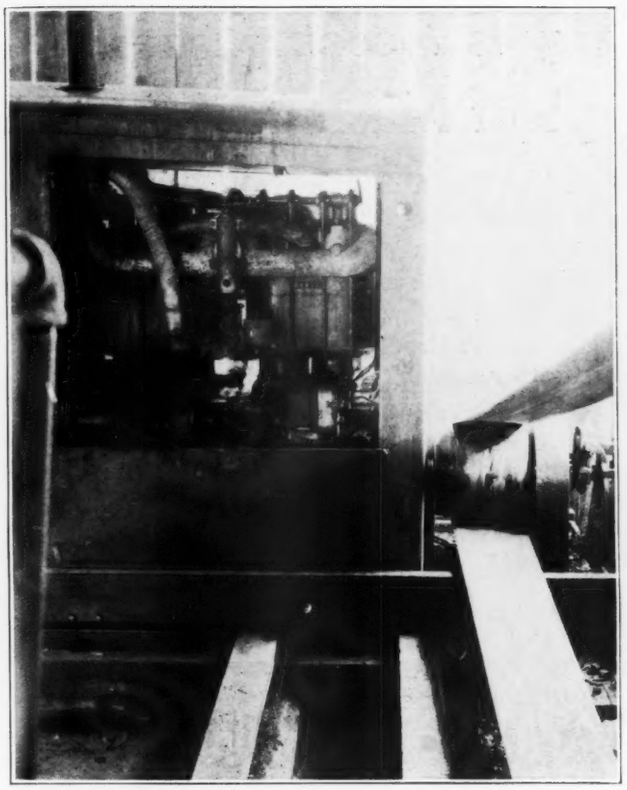
Interior of Packing House, Scale in Foreground

The quarry is located at some distance from the plant to which it is connected by over a mile of 36-in. gauge track which winds its way through the hills, a miniature scenic railway. A Plymouth 4-ton gasoline locomotive hauls the stone to the plant, handling as many as ten Koppel 2-cu. yd. steel side-dump cars per trip.

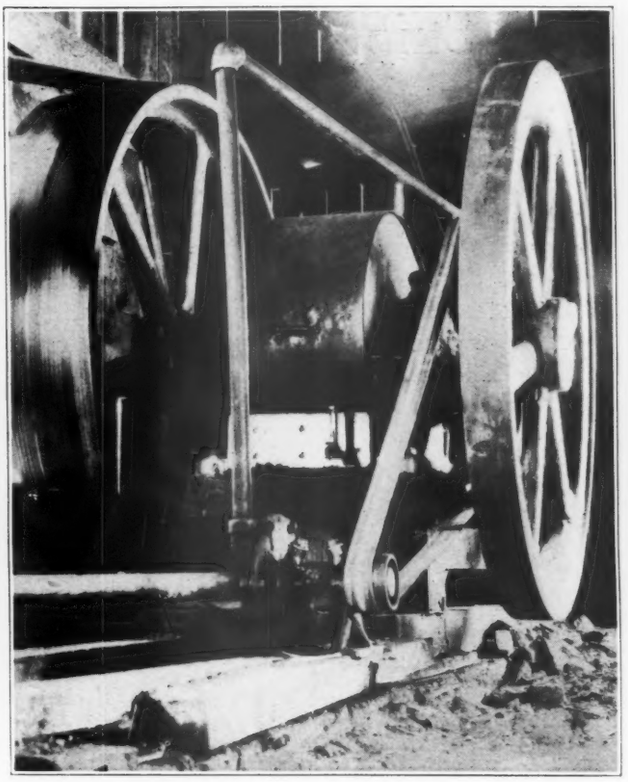
As there is very little overburden to the deposit, no stripping is necessary. The stone is all loaded by hand. Blast holes are drilled by two Chicago Pneumatic jackhammers which handle drills up to 16 feet in length. The bank method of blasting is used, as many as 20 holes being shot at one time. The quarry face varies between 30 feet and 40 feet in height, necessitating working on two levels. Peerless 40-per cent dynamite and Ensign Bickford safety fuse are used exclusively. H. D. LeCroy, son of the superintendent, is in charge of the quarry. He does most of the drilling and blasting, and operates the locomotive. Several Negroes do all the loading of cars.

A small building at the quarry houses a Chicago Pneumatic air compressor which is belt-driven by a Novo 4-cylinder, 4¾-inch by 6-inch gasoline engine. This furnishes air for the jackhammers. A small pulley on the compressor shaft drives, by belt, a small Worthington centrifugal pump which cools the compressor with water from a nearby

View of Plant from West



Novo Engine Driving Quarry Compressor



Compressor at the Quarry, Small Water Pump in Foreground

creek. The belting is all of Goodrich make.

The locomotive hauls the cars to the foot of the incline leading to the top of the kiln. They are then hauled up the incline, one at a time, and dumped by hand. A Novo gasoline hoist, at one side of the kiln, furnishes the power through a Sauerman cable and blocks.

The plant is about 3 years old although it has been operated by the present owners for only a little over a year. It is a one-kiln plant and has a capacity of about 200 barrels per ten-hour day. A large storehouse adjoins the kiln. In this the lime is stored, both loose and in sacks and barrels. All packing is done by hand and the weighing is done on a portable Buffalo 600-lb. capacity scale.

(*Continued on Page* 82)

Car Used For Transporting Material

Stripping in This Quarry Is Accomplished by a Special Type of Machine

ALMOST every gravel plant and stone quarry is confronted by the problem of stripping. Scarcely without exception, stripping or the removal of overburden, involves excavation by means of a steam or electric shovel. During the greater part of the operating season this creates considerable overhead expense but even greater costs are incurred by the disposal of the soil, clay, or loam after it has been excavated. In a few instances the topography of the ground is such that hydraulic and other stripping methods can be accomplished but, generally speaking, the shovel is the accepted stripping unit.

Likewise the removal and disposal of the stripping has been practically standardized by the use of cars, which haul it, often a great distance, to a point where it will not interfere with the future working of the deposit. This hauling expense has been greatly reduced and minimized by the France Quarries Company, of Toledo, at the Kenton, Ohio plant. This company excavates its overburden by the usual steam shovel method but immediately dumps it into the worked-out quarry bottom by means of a long portable belt conveyor. This conveyor follows the stripping shovel and reaches to a point in the quarry beyond the path of the main excavating shovel and the quarry cars.

This portable conveyor consists of a 36-inch belt at 150-foot centers. It is mounted in a long structural steel frame which, in turn, is supported on triple caterpillars. The conveyor frame is pivoted over the caterpillars, at a point 40 feet from the feed end, which leaves 110 feet cantilevered out over the open quarry. The pivoted feature permits the conveyor to slant at any angle to suit the lay of the ground. The conveyor frame revolves on its base like a steam shovel and the entire unit is self-propelling. The stripping shovel dumps the overburden into a 7-foot by 7-foot hopper which is attached to the lower end of the conveyor frame. The top of the hopper is 10 feet above the ground. Underneath the hopper, a steel apron feeder automatically controls the flow of the dirt, including large lumps, onto the belt conveyor.

The equipment is electrically driven throughout. It was designed and built by the Greenville Manufacturing Works, a division of the American Aggregates Corporation. The unit is called a stacker because of the previous use of a quite similar outfit by the latter concern for piling gravel in its retail storage yards.

Side View of Machine That Disposes the Overburden on Waste Piles

The illustration herewith shows the machine in its usual working position. The facility with which the waste material is conveyed across the working portion of the quarry is well indicated.

Beachville Companies Have Reorganized

There has been considerable reorganizing in the lime industries of the Beachville, Ontario, Canada district. The Beachville White Lime Company, Limited has sold its West quarry and crushing plant to the American Cyanamid Company.

The Beachville White Lime Company and Standard White Lime Company have amalgamated their interests into the Beachville Lime and Stone Limited, with a capitalization of $900,000 and the following officers: D. Kennedy, president; C. E. Downing, vice-president and general manager; W. P. Gamble, secretary-treasurer.

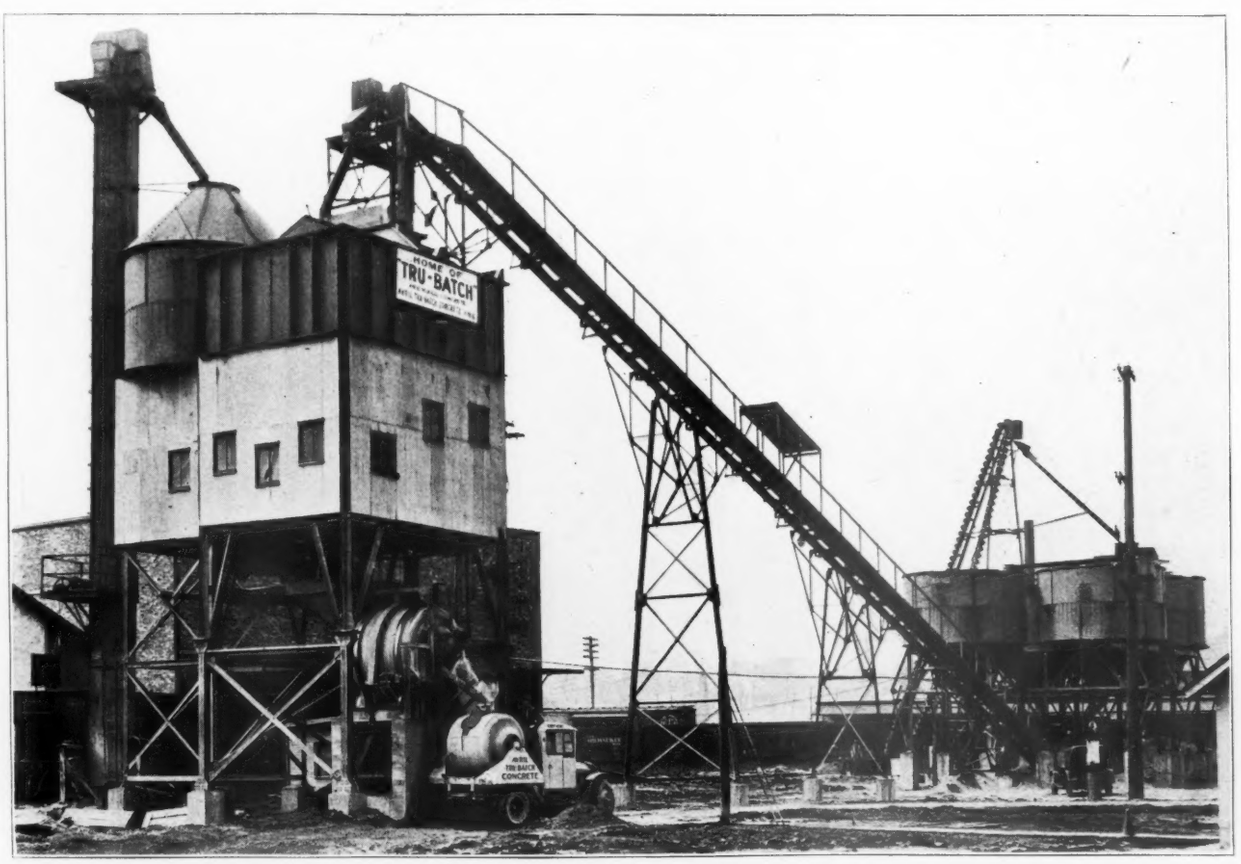
First Ready-Mixed Concrete Plant in Cincinnati Delivers Concrete in Specially Designed Trucks

AVRIL TRU-BATCH CONCRETE, Incorporated, operates a central concrete-mixing plant in Cincinnati, Ohio, which not only has the distinction of being the first in that city but is one of the most modern and efficient operations of its kind in existence. The plant is located at Este Avenue and the Baltimore and Ohio railroad, in Winton Place, on a property of one and one-half acres. Construction was begun in July, 1928, and the plant went into operation in October of the same year.

The plant is of all-steel construction with concrete foundations and pits, structural-steel framework, steel bins, and corrugated steel siding and roofing. The entire plant was designed by Arthur C. Avril, president of the company, in collaboration with the Blaw-Knox Company which erected the plant and furnished and installed a large part of the equipment. The plant's capacity of 350 cubic yards per eight hour day is achieved with a force of four men and a foreman.

The sand and gravel used is shipped from a plant in the vicinity, onto a siding from the Baltimore and Ohio railroad. Three sizes of gravel and

H. J. McCafferty, A. C. Avril, F. H. Mollenberg



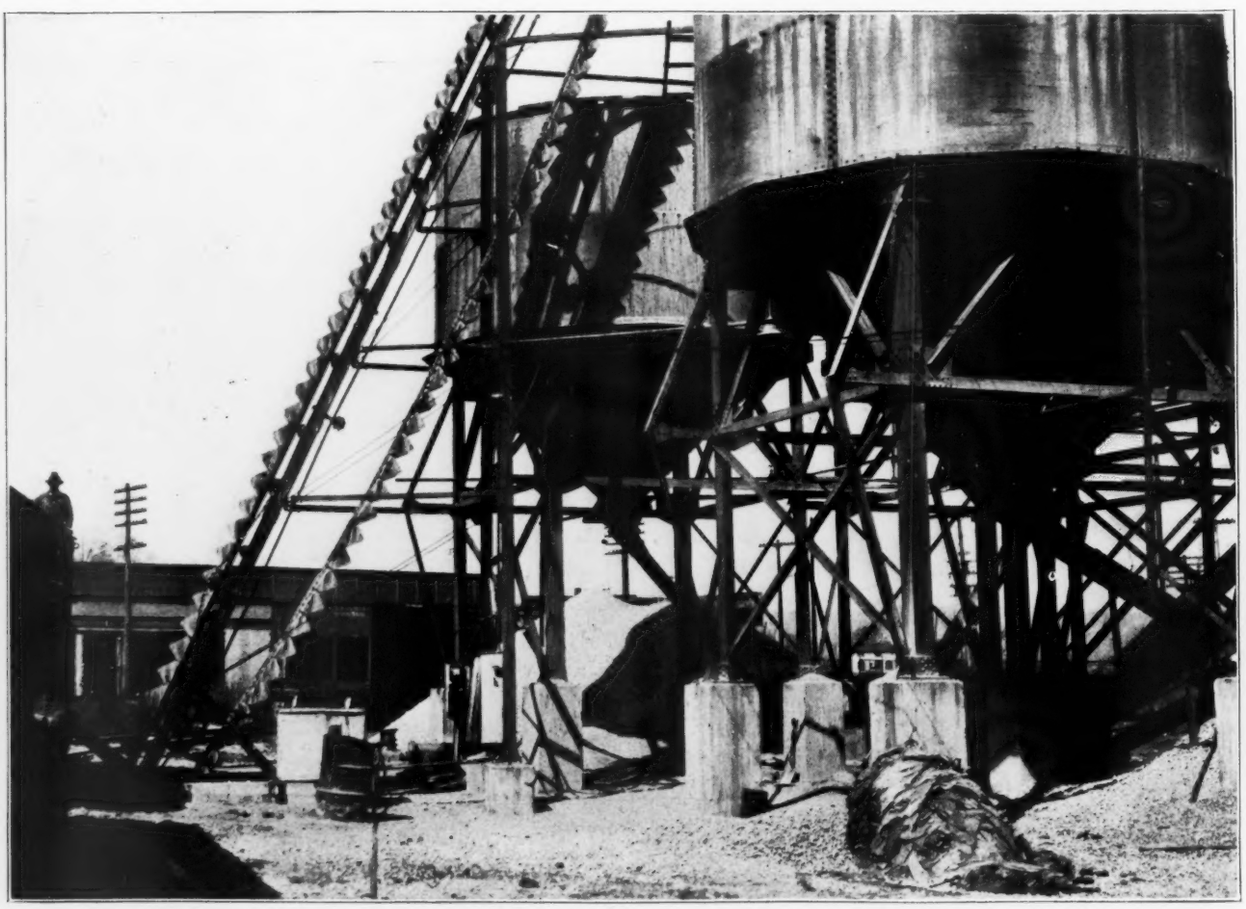
View of Plants, With LeBlond-Schacht Truck at Mixer

One of the Company's Trucks of Own Design

Loading One of the Hug Trucks

one of sand are used, so that any required mix can be furnished. All of each material comes from the same pit to insure uniformity.

The gravel is discharged at the plant from bottom-dump railroad cars into a track hopper. A Mead-Morrison 5,000-lb. capacity capstan-type car puller, driven by a 7½ hp. Lincoln motor, moves the cars into position for dumping. A Columbus bucket elevator with 8-in. by 16-in. buckets, chain-driven by a 20-hp. motor, elevates the material 65 feet to the four Blaw-Knox circular steel bins, each of which is 18 feet in diameter and has a capacity of 196 tons. The elevator is fed from the truck hopper by a Columbus reciprocating plate feeder driven by a 20-hp. motor. This unloads a



Car Being Unloaded to Elevator and Bins

LeBlond-Schacht Truck Dumping at Job

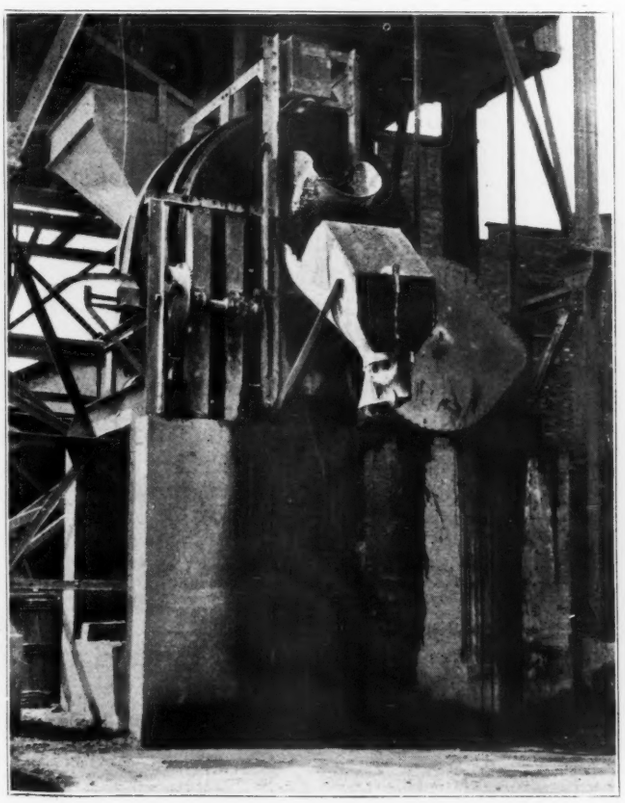
A Hug Truck in Dumping Position

standard car in 45 minutes. A swivel chute at the discharge end of the elevator allows loading into any bin desired. The material is discharged from the bins through swivel spouts onto an 18-inch Columbus belt conveyor 185 feet long, gear-driven by a 15-hp. motor, which conveys the material to the top of the mixing plant. Here it is discharged through another swivel spout into a Blaw-knox steel bin of 200-ton capacity with four compartments for the different sizes of aggregates.

Cement is delivered in bulk in railroad box-cars on a separate siding. No special brand is used. The cement is unloaded by a Columbus power scraper, operated by a 5-hp. motor, into an enclosed bucket elevator which elevates it 65 feet to a circular steel Blaw-Knox bin at the top of the mixing plant. This bin has a capacity of about 600 barrels. The elevator has 6 by 10 in. buckets and is driven by a 7½ hp. motor.

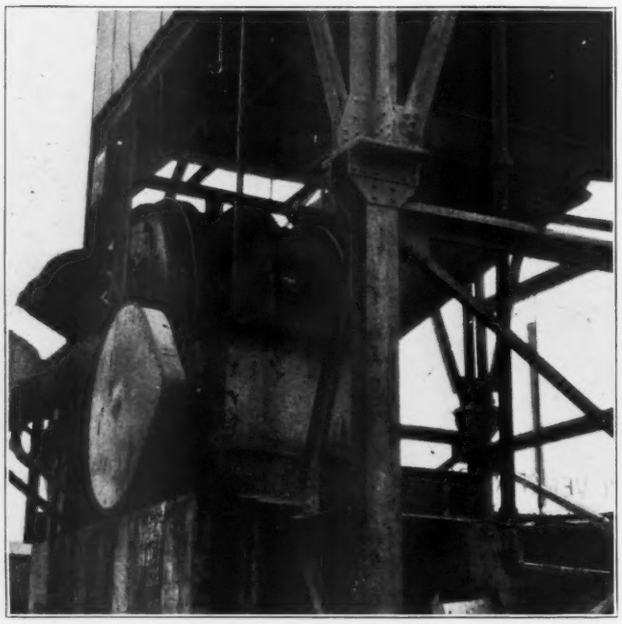
Each of the four aggregate bins and the concrete bin is equipped with a Blaw-Knox weighing batcher and each of these has a standard dial scale attached. The aggregate discharges into these batchers by gravity, while the cement is fed from the bin by a Jeffrey screw conveyor. A small air pump keeps the cement from clogging in the bin. Each of the scales is equipped with a dial which weighs the last 200 pounds of each batch, thus speeding up the operations and preventing any possibility of the operator over-running his quantities.

When weighing operations are completed, the



Close-up of Concrete Mixer

Cement Elevator, Bin, and Mixer



Hopper and Mixer, Under Batching Floor

Elevator to Bins, and Conveyor to Mixing Plant

cement and aggregate are discharged by gravity into the mixer, which is a Ransome 2 cubic yard type 56-S, gear-driven by a 40-hp. motor. Water is added from a Ransome water-measuring tank which accurately delivers the amount desired, a feature being that when required, the amount may be changed almost instantaneously for each individual batch. At present, all orders are being transmitted from the office to the mixing platform by megaphone but an electrical signalling system is soon to be installed.

The use of three different sizes of coarse aggregate allows the design of the concrete on a "fineness modulus" basis, any gradation being possible by using the desired quantities of each size. This method, in addition to the use of the water-cement ratio in the design of each mix, results in a very accurate control of the strength and quality of the concrete. That the concrete produced is of a very high quality is attested by the following averages of compression tests made at the jobs:

Mix	*7-Day Test*	*28-Day Test*
1-3-5	over 2,000 lb.	over 3,500 lb.
1-2-4	over 3,000 lb.	over 4,500 lb.
1-1½-3	3,500 to 4,000 lb.	5,500-6,000 lb.

The aggregate and concrete are heated in cold weather, steam for this purpose being furnished by a Lookout Boiler Manufacturing Company, 25-hp. boiler. Concrete is sent out of the plant in winter at about 100 degrees F. and never loses more than 15 degrees in transit, regardless of the distance of the haul. Only three days have been lost since the plant started in operation despite the unusually severe winter.

Two types of trucks are used for delivering the concrete. One is the LeBlond-Schacht, with a special body, and the other is a Model 81 Hug truck with the Hug redi-mix body, two of the latter being in service. This truck has a four-cylinder Buda engine with four speeds forward and is equipped with a hydraulic quick-dumping hoist.

The LeBlond-Schacht trucks are equipped with 2-cubic yard capacity rotary bodies which were developed by A. C. Avril in collaboration with the LeBlond-Schacht engineering department. Three of these trucks are in operation, while six more are to be delivered within thirty days. The chassis are the regular 2½-ton models with 6-cylinder Waukesha engines. Each truck has pneumatic tires with duals on rear, mounted on Budd steel wheels.

The capacity of this truck is two cubic yards when about two-thirds full, the vacant space being reserved to permit agitation of the concrete as the cylinder rotates. The cylinder is driven by a chain through a worm gear from a transmission power take-off. The body rotates on self-aligning SKF roller bearings and is filled and emptied through a water-tight door operated by a gear and ratchet mechanism.

Officers of the company are: Arthur C. Avril, president and founder; Milton Bauer, vice-president, and George H. Riehl, secretary and treasurer. Mr. Avril was previously connected with the France Stone Company of Toledo, Ohio, in the cacapity of mining engineer.

The U. S. Bureau of Reclamation has constructed a total of 125 dams. These range from simple diversion dams, less than 3 ft. in height, to the Arrowrock storage dam, with a maximum height of 348.5 ft., which held the record as the highest dam in the world, which will soon be surpassed by the Owyhee Dam.

Screw Conveyors Are Features in the Plant of the Pownal Lime Company

By F. A. WESTBROOK

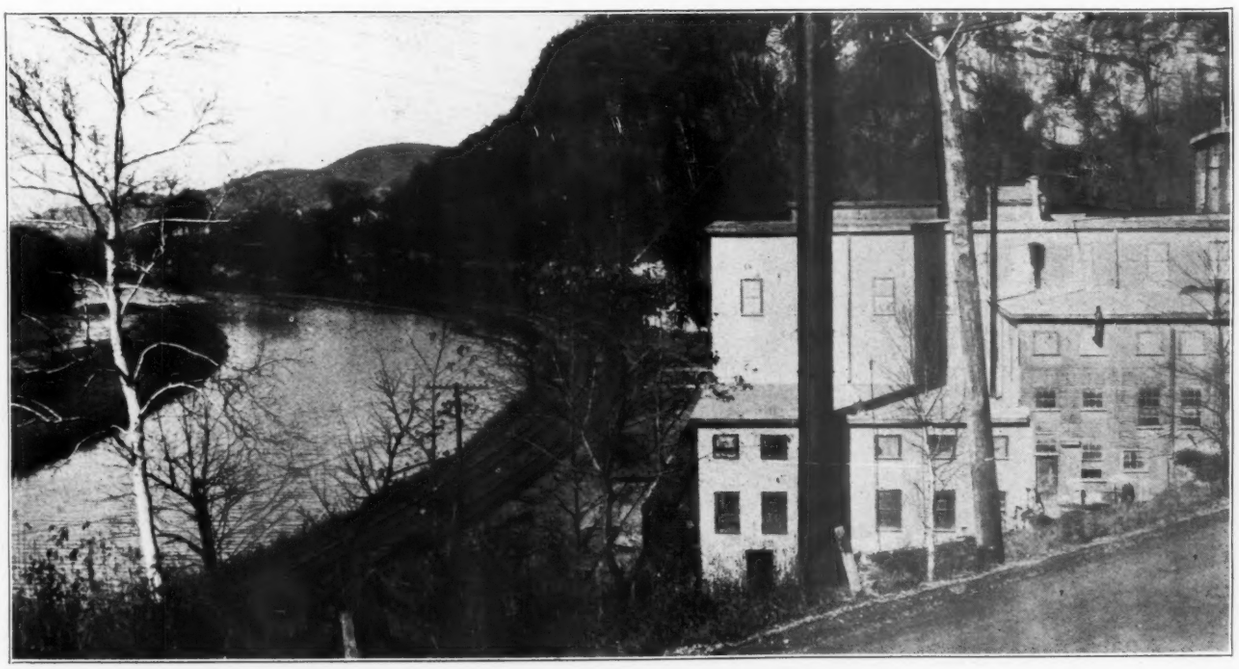
PERHAPS the outstanding features of the Pownal Lime Company's plant at North Pownal, Vermont, or at least that which at first most strikingly attracts the visitor's attention, are its unusually large storage capacity, amounting to 9,000 tons, and the elaborate system of screw conveyors used to handle the material. The product is exclusively ground limestone, used mostly for agricultural purposes and chicken grit. Operations are usually carried on for about nine months of the year and discontinued on the approach of winter when the storage bins are full, shipments being made during the closed season from stock. All shipments are made by rail to New England and New York state points, which is simplified by the fact that the plant is on the main line of the Boston and Maine railroad with a siding to the loading platform. The capacity of the plant is 100 tons per day. It has been in successful operation for fourteen years.

With this general idea in mind it will be possible to understand the various details of the operation the more easily. The quarry is on the side of a high hill above the plant and has a breast from 75 to 80 feet in height which, however, is not very wide. Drilling is done with Ingersoll-Rand X-70 drills in benches. The face is not wide enough or the required tonnage great enough to call for well drills. Usually the procedure is to drill two

View of Plant from Quarry. Store House at Right

rows of staggered holes about 6 feet apart with the front row 6 feet from the edge. The bench is about 12 feet wide, so that the back row of holes is against the face. Sixty to seventy holes are usually fired at a time with 40 per cent Dupont dynamite bringing down, as a rule, something like 1,500 tons at a blast. Ingersoll-Rand jackhammers are used for drilling the large blocks. The overburden is so light that very little loss is encountered in disposing of it.

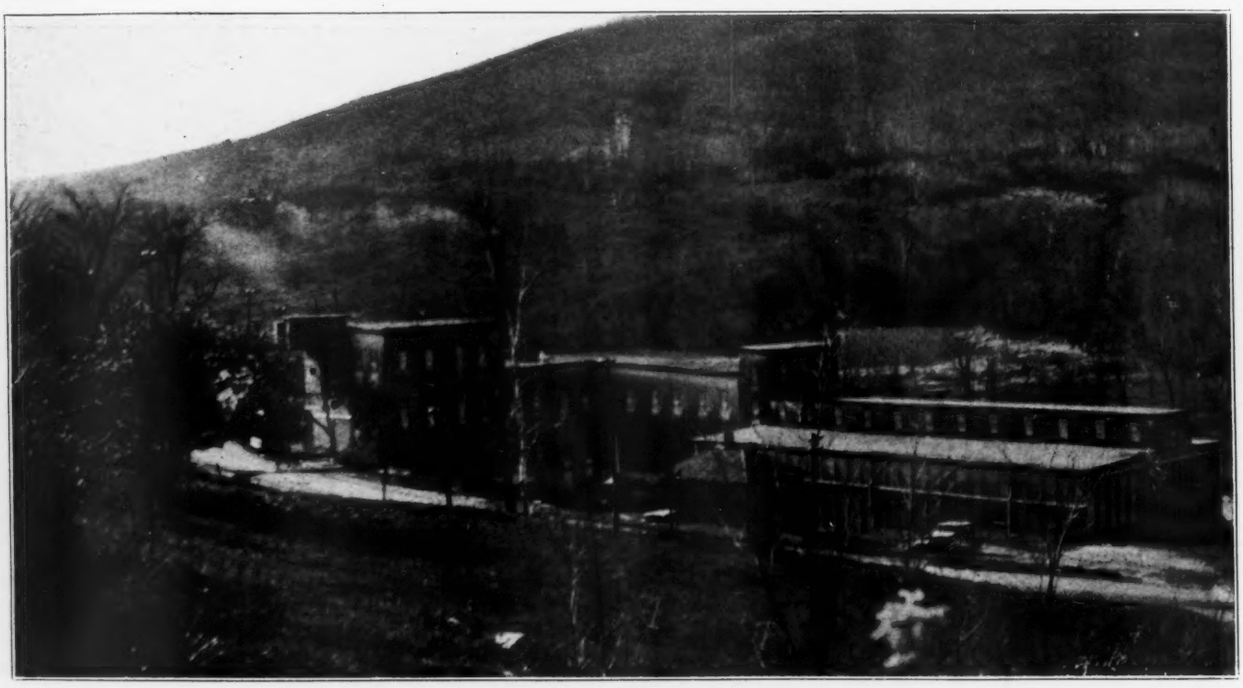
Stone is picked over by hand and thrown into dump cars. Watt Car and Wheel Company side-dump cars are used for refuse material which is run out on a trestle and dumped. Stone for the plant is placed in end-dump cars and lowered down the incline by gravity. A Lidgerwood steam hoist is provided to pull up the empty cars.



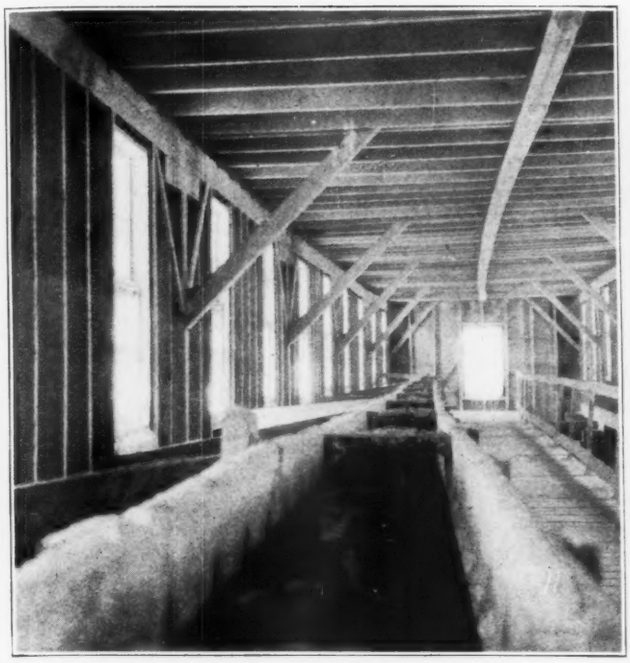
View of Plant, Facing Railroad and Hoosic River

View of Quarry and Tracks

The plant itself is near the bottom of the valley and the quarry cars, as they come down from the hill, cross the highway on a bridge and enter the top of one of the buildings. Here they are dumped into a chute leading to a No. 7½ Gates gyratory. From the bottom of this primary crusher the stone is elevated to a large crushed-stone bin. Under this there is a feed table which regulates the flow of stone to a Stephens-Adamson belt conveyor leading to a chute which discharges into a Williams hammermill, No. 3 semi-vulcanite. This crushes the limestone to ¾-inch or less in size. The stone is again elevated, by the rock elevator, to another bin, this time discharging into two Bradley 3-roller pulverizers. These mills are very efficient for they are capable of handling from 8 to 10 tons per hour apiece when everything is running smoothly, as is usually the case. Seventy-five to 80 per cent of the material will go through a 100-mesh screen after passing through these machines. If the bins over



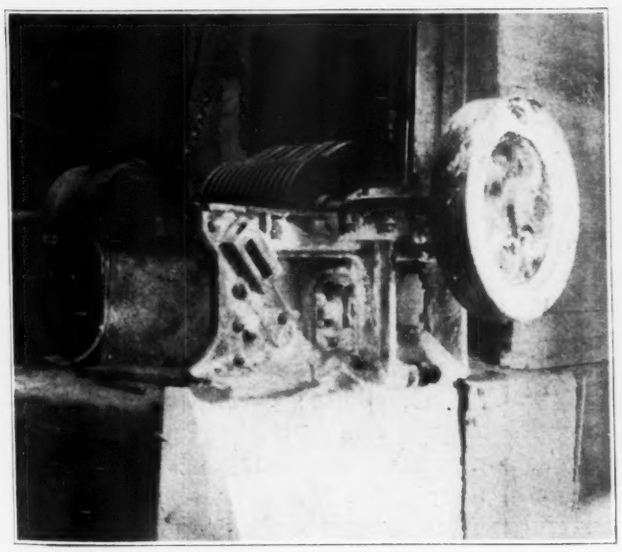
View of Plant Hills in Background Are Across the River



Screw Conveyor Above Bins

these two mills fill up, the stone may be diverted into a special storage bin for temporary storage. From under this there is another Stephens-Adamson belt conveyor leading back to the rock elevator by which the stone can be returned to the bins which feed the Bradley mills.

The pulverized material flows by gravity from the bottom of the Bradley pulverizers to screw conveyors which deliver it to an elevator leading to the top of the plant. This discharges into a screw conveyor extending across the width of the building and which may be made to deliver into any one of three parallel screw conveyors extending along the length of the building over the storage bins. One of these conveyors is 210 feet long and extends to the most distant bins. It is divided into sections so that it is not necessary to drive the



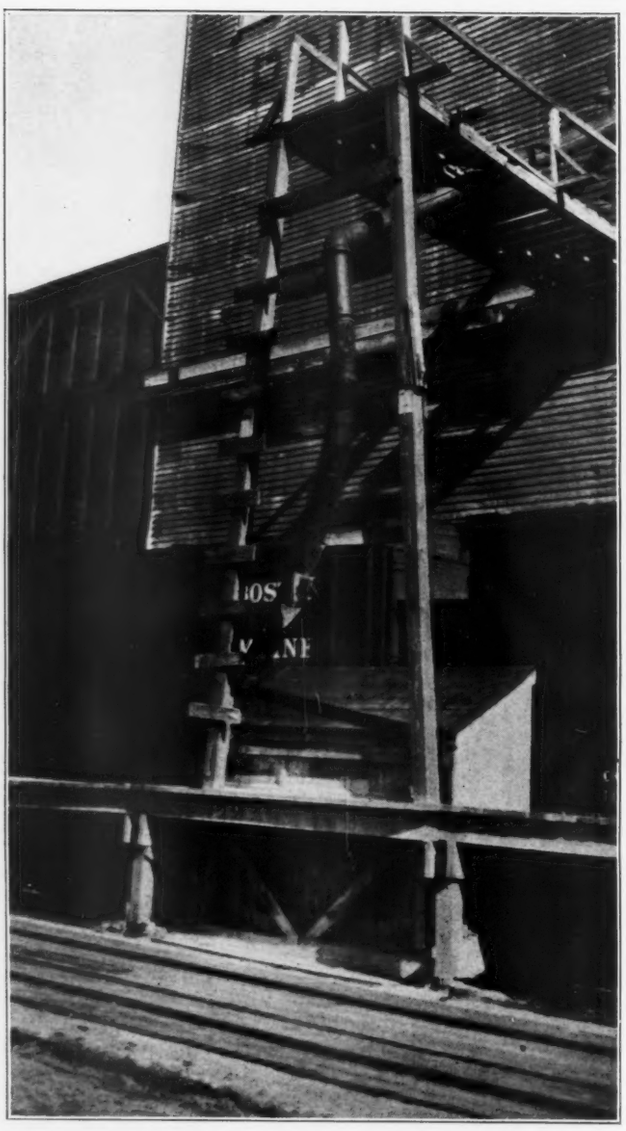
Hammer Mill

Primary Crusher

One of the Bradley Mills

whole length at times when the nearer bins are being filled. It has been in use for more than four years and has given satisfactory service in spite of the heavy stresses upon it due to its unusual length. All of the screw conveyors and, in fact, about all of the conveyor equipment in the plant, were furnished by Stephens-Adamson Company.

For reclaiming material from the bins for shipment, there is a screw conveyor in a tunnel underneath the main building. It does not extend under the most distant space reached by the 210-foot conveyor, but just up to it, and the ground limestone is delivered to it by means of a grain-shovel outfit with a drag scraper. This underground conveyor delivers to an elevator which carries the material to another screw conveyor at the top of the building, this conveyor leads to the bins over the two Bates valve baggers. The conveyor may be used also to deliver to a movable spout on the outside of the building for the bulk loading of freight cars. In fact, any of the conveyors used to fill the bins can be made to deliver to this movable spout.



Flexible Spout for Loading Freight Cars

One of the Bagging Machines

All of the foregoing applies to the production of agricultural limestone. When it is desired to produce chicken and hen grit, the material is diverted at the top of the rock elevator through a chute leading to a Newago separator instead of into the bins over the Bradley mills. This Newago separator has a triple screen. The two sizes of poultry grit go through chutes into storage bins provided with bagging spouts underneath. The oversizes drop to an inclined belt conveyor which discharges into the hoppers over the Bradley mills.

Most of the plant is run by steam power. The Robb Engineering Company horizontal tubular boiler is of 215-h.p. capacity. This serves a Hewes & Phillipps corliss 16-inch by 36-inch single cylinder engine which drives the crushing, grinding, and conveying machinery. The main drive for this is a 24-inch leather belt. A straight-line Sullivan steam-driven compressor operates the drills. A Westinghouse automatic vertical-compound engine, direct-connected to a generator supplies electrical current for the two Bates bagging machines and to the motor which drives the conveying machinery for reclaiming the finished material from storage. The idea of having a separate source of power for bagging and reclaiming is practical, as shipments are made from storage all winter when the rest of the plant is shut down and it would be wasteful to run the large corliss engine just to do this comparatively small amount of work.

Spring Meeting of Testing Engineers Discussed Pertinent Problems

THE annual spring group meeting of the American Society for Testing Materials was held in the Stevens Hotel, Chicago, March 19, 20, 21 and 22. This plan of holding a number of committee meetings over consecutive days, which is probably unique in the activities of that Society, has worked successfully conserving the time and expense of those members who serve on a number of committees. The railroads granted reduced rates on the Certificate Plan. The committee met early and late, starting with sessions in the morning and extending through the afternoon and evening with but one break, a dinner and entertainment on Wednesday evening.

Those members who had an hour or two available were enabled to visit such points of interest as the plants of the Western Electric Company, Illinois Steel Company, Inland Steel Company, The Pullman Company, Universal Cement Company, International Harvester Company and the Laboratories of the Portland Cement Association. The total number in attendance was 375, members of 25 committees which held approximately 93 meetings.

Committee C-7 on Lime

Of considerable interest was the meeting of the committee on lime of which H. C. Berry, professor of Materials of Construction, University of Pennsylvania, Philadelphia, is chairman and W. V. Brumbaugh, technical director, National Lime Association, Washington, D. C., is secretary.

The project for establishing plastering specifications of national scope, under the guidance of Sectional Committee of the American Standards Association, to be sponsored by the American Society for Testing Materials and the American Institute of Architects, was thoroughly discussed, and the methods of procedure clearly outlined at the meeting. This proposition is already in motion, and the actual work of preparing such specifications will be started within a short time.

The attention of the committee was called to the need for investigation and experimental work in connection with finishing lime, and as a result it was decided to reorganize the existing sub-committee on Structural Lime to actively take up this important work.

Sub-Committee V on Methods of Test of Lime and Lime Products is giving consideration to several modifications of the methods for determination of available lime and to a shorter method for determining soundness of limes for plastering purposes.

Committee C-9 on Concrete And Concrete Aggregtes

Committee C-9 on Concrete and Concrete Aggregates of the American Society for Testing Materials held a well-attended meeting with Cloyd M. Chapman, consulting engineer, New York City, chairman, and Stanton Walker, director, Engineering Research Division, National Sand and Gravel Association, Washington, D. C., secretary. Its principal business was receiving reports from its various sub-committees which had held sessions the day before.

The committee feels that it has made a great deal of progress during the year and that it has laid the ground work for more definite accomplishments in the future. An important step in facilitating its work has been the division of its problems into a large number of specific projects and assigning the responsibility for each of them to small groups within the various sub-committees. The committee now has under consideration about 75 projects on which active work is being carried out.

Although the committee was reorganized last year, it will have definite reports of progress on subjects of interest to all engineers using concrete. Revisions in a number of the existing tentative specifications will be offered. Most important of these is the proposed revision in the standard method for making and storing specimens of concrete in the field, which will be revised to include more adequate instructions for securing curing conditions more nearly comparable to those of the structure. Work is also being carried out looking toward the suggestion of revisions in a number of sections of the 1924 report of the Joint Committee on Concrete and Reinforced Concrete. It is expected that a new specification will be proposed, outlining the standard procedure for carrying out flexure tests on concrete beams for use in the control of concrete.

Progress reports are expected at the annual meeting on questions such as a method for designing concrete to obtain a definite flexural strength, procedure for carrying out accelerated soundness tests of aggregate, effect of stone dust on strength of concrete; method of test for determining soft or rotten particles in aggregates and on the effect of various extraneous materials in aggregates such as coal, shale, mica, etc.

Among the projects on which work is being carried out, but on which no report is expected this year, may be mentioned standard procedure

for making specimens of concrete where large size aggregate is used; method of testing drilled cores as a basis for acceptance of concrete work; relation of brasion test for slag to its concrete-making properties; relation of shape of particles of aggregate to their cross-bending and compressive strength, and the development of a method for measuring workability of concrete.

General subjects under consideration include measurement of materials, mixing and placing of concrete; curing of concrete; measurement of volume changes in concrete; and conditions affecting the durability of concrete. The sub-committee having in hand the measuring of materials mixing and placing of concrete, is paying particular attention to a procedure for measuring the segregation of the constituent materials in a batch of freshly laid concrete.

The sub-committee studying curing is making a careful review of available information on the question and is outlining desirable research work which should be carried out in that connection.

A careful review of the apparatus used for carrying out tests sponsored by Committee C-9 is being made by a special sub-committee. It is hoped that the work of this sub-committee will facilitate the manufacture of apparatus meeting with the standard requirements.

Committee D-4 on Road And Paving Materials

An interesting and well attended meeting of the Society's Committee D-4 on Road and Paving Materials was held on Tuesday, March 19 with R. W. Crum, director, Highway Research Board, National Research Council, Washington, D. C., chairman, and Prevost Hubbard, Chemical Engineer, The Asphalt Association, New York City, secretary. New specifications were approved for publication as tentative for gravel for bituminous concrete base, as were also specifications for Portland cement concrete for pavement and for pavement base.

The committee took action to advance to standard two specifications for broken stone for bituminous macadam and waterbound macadam surface course, a specification for bond for sheet asphalt and bituminous concrete pavement and method of test for the determination of moisture equivalent of sub-grade soils in the field. Two other specifications for broken stone were revised.

The committee also approved revisions in respect to the abrasion test requirements of the present standard specifications for granite block.

The present tentative specifications for natural or artificial sand-clay mixtures for road surfacing together with the tentative method of test for quantity of clay in sand-clay, topsoil and semi-gravel for highway construction were withdrawn.

The committee received an interesting report on definitions relating to bituminous materials resulting from the conference which Mr. Hubbard had had with the British as the Society's representative. The definitions under discussion at that time had been referred to a conference group of the Society's Committees D-2 on Petroleum Products, D-8 on Waterproofing Materials, and D-4 on Road Materials.

This was the first meeting held as far West as Chicago and was so successful largely due to the efforts of the Local Committee on Arrangements.

Do You Watch Your Overhead?

"I did the largest business in 1928 that I have ever done," said an operator. "I thought my profits would be larger than they have been usually, yet they were considerably less, as shown by a balance from my books. I can't understand it."

The answer to this operator's quandary is the same as to many others: excessive overhead expenses and charges.

Many such expenses and costs are not readily detected from week to week, nor during the month, but they eat into profits and they can become so excessive as to take up all of the margin in the profit-and-loss account. This is especially true when a rush of business comes, or when the volume of business increases rapidly upon a permanent basis.

Another condition that can add materially to cost and can consume profits prevails when, for a short period, a peak of sales is reached. This generally means increased orders from old customers in addition to the usual orders from new customers. The entire organization is on edge to please customers, and operating costs actually jump. Such a condition may be of short duration, but with the overhead expenses once adjusted to the larger scale, they continue so whether the plant be idle or is working to maximum capacity.

Excessive overhead is the bugbear of any business, and has wrecked many an organization. In pit and quarry operations it is an item that is difficult to control. Increased volume of business does not mean an increased profit unless the overhead expense can be kept to a reasonable minimum.

In many manufacturing lines overhead is easily accounted and regulated, but in the operation of pits and quarries there are many overhead expenses that are difficult to control. This entails the necessity of a strict watch upon such expenses and a budget system to keep such costs within reason. At the beginning of a new season, it is well for each operator to ask himself if he is watching his overhead.

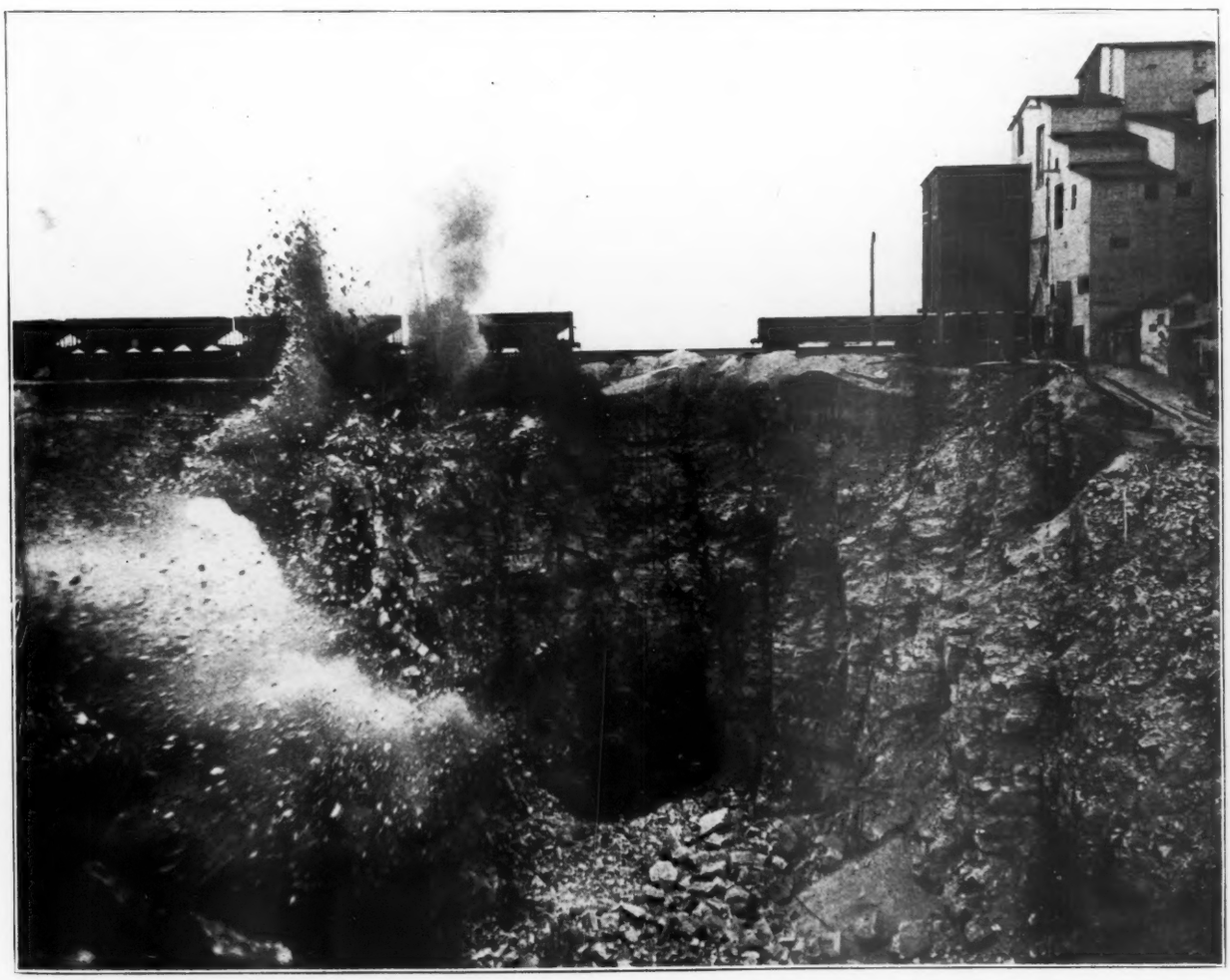
A New Type of Explosive Is Entering the Quarrying Industry

LIQUID oxygen has been used as an explosive since the end of the last century, but it was not until the Great War that its use became at all general. With the supplies of Chilean nitrate virtually stopped, Germany had to rigidly conserve her supplies of this material, and this gave a great impetus to the development of other explosives. By 1921 there were many plants scattered throughout Europe for the manufacture of liquid oxygen explosives, their production being utilized in mining such widely different materials as salt, potash, coal, iron, limestone, and granite, both underground and in open workings.

The manufacture of this explosive is simple. Purified air is compressed, liquefied, and then separated into its two main constituents—oxygen and nitrogen. The oxygen is retained in liquid form at a purity of about 99 per cent. This liquid is extremely cold, being about 297 degrees below zero F. Various devices have been perfected to store and handle it with minimum loss by evaporation. One copper mine in South America stores the liquid in six 1,000-gallon vacuum-walled steel tanks; the manufacturer's plant on the outskirts of Chicago uses a large non-vacuum tank holding 500 gallons; and other plants use small vacuum bottles holding 6 to 10 gallons of liquid.

The liquid itself, though the greatest known supporter of combustion, cannot burn or explode, and is safe to store. The cartridges are made in varying sizes and strengths to suit different blasting requirements. Storing and handling the dry cartridges presents no hazard of any kind, as they are inert. The most usual size is perhaps 4½ inches in diameter by 22 inches long, for use in a 5⅝-inch well drill-hole. The cartridges are made in two general styles, one for dry holes and another for water-filled holes.

The blasting procedure is to pack the required cartridges in special soaking boxes and then to soak them with liquid oxygen. After being soaked, they may be left in the boxes for more than 25



View in Quarry at Moment of Blast

View After the Blast From Bottom of Quarry

hours without appreciably deteriorating, which is a great advantage, as the boxes may be transported by truck to considerable distances.

Up to the moment of soaking there is no hazard, for there is no explosive. After soaking, the cartridges form a high explosive, but still a safe one. Such cartridges cannot be detonated by ordinary shock or friction, or by flame, though they are inflammable and care must be exercised to keep such things as lights and cigars away.

Considerable attention is being given to the adaptability of this general kind of explosive in quarrying. It is now used successfully and satisfactorily in several of the midwestern states. It has met with favor in open-pit or strip coal mines of Illinois, Indiana, and Kentucky, as well as in limestone quarries in the Chicago district.

It is particularly suited to the blasting of the huge tonnages that are handled in so-called porphyry copper mines and is being made the standard explosive in Chile, South America, at one of the world's largest copper mines, where some 1,200,000 tons per month are being blasted, largely with one variety of this type of explosive that goes by the trade name of Loxite.

When liquid oxygen came into general prominence during the war it was called L. O. X.—abbreviation for liquid oxygen explosive.

Loxite is a perfection of L. O. X., and consists of a cartridge made up of various carbonaceous materials soaked in liquid oxygen. These are detonated by Cordeau-Bickford safety fuse or by special electric blasting caps.

Users of this explosive emphasize its following advantages over dynamite: Better primary fragmentation, less secondary blasting, increased shovel efficiency, substantial direct savings, no danger incident to digging into missed holes, and no storage hazard.

The Dolese & Shepard quarry at Hodgkins, Illinois, has used Loxite in firing more than twenty-five blasts. These shots have been made both on the upper bench, where flux stone is quarried, and on the lower level where there are harder deposits of limestone. In primary blasting alone this quarry's savings have conservatively been placed at over 20 per cent. Thomas M. Jones, quarry superintendent, and William J. Schuett, quarry foreman, speak highly of this explosive and are enthusiastic over the additional savings which they will secure because of the very apparent reduction in secondary shooting and the increased shovel efficiency.

At the quarry of the People's Crushed Stone Company near LaGrange, Illinois, several blasts have recently been fired under the supervision of Dr. F. D. Holbrook and W. A. Smith, officials of the company. The first and third blasts were in an 85-foot bank and the others were sink shots comprising from ten to fourteen 35-foot holes. In these latter blasts, the holes had an average of 24 feet of water. The results were reported very satisfactory to two members of the editorial staff of PIT AND QUARRY, who, on March 23, 1929, had the pleasure of witnessing the latest big blast. This was of seven bank holes, each ninety feet deep. The excellent photographs herewith tell their own story about the effectiveness of the blast. No caps were used in any of the holes. Instead, Cordeau-Bickford fuse accomplished the detonation. Readers may wonder if one of the photographers really survived the barrage. He did. It is surprising how little smoke resulted from the blast. What appears like smoke in the picture was largely limestone dust, which settled quickly.

While no explosive can be said to be the best for all operations and conditions, Loxite, due to its flexibility, controllable strengths and speeds, its efficiency and lower cost, and especially its many inherent safety features, has undoubtedly come to stay and promises to be increasingly used as a blasting agent in the open-pit and quarry field.

This product is the Keith Dunham Company's perfection of liquid oxygen explosives. There are a number of installations which have been in operation for sufficient time to enable any interested quarry, strip-coal mine, or other open-pit operator ample opportunity to study its performances and value.

Mill Makes Safety Record

The Blue Hole Mill of the Indiana Quarry Company, Bedford, Indiana, reports having operated a year without a lost time injury.

Gypsum and Anhydrite as Retarders of Cement Setting

DR. C. R. PLATZMANN*

THE use of gypsum and anhydrite as retarders of the setting of cement is highly important both from the scientific as well as the practical standpoint. It is therefore the more astounding that there are so few and scant references to this subject in the literature on cement. The following article was written as a review of the material that is found in literature so that the cement man may know exactly what has been published on this important subject.

In order to understand the activity of gypsum or anhydrite as a retarder of the setting of cement, it is important to know its solubility in water. The following tabulation, taken from Chemiker Kalender, 1928, volume II, page 327, gives the solubility of gypsum at various temperatures.

Temperature in Degrees C.	Solubility in 100 Grams of Water	
0	0.176	
10	0.193	
18	0.202	
25	0.208	
30	0.209	
40	0.211	
55	0.208	
60	0.200	($CaSO_4.2H$ O.).
100	0.155	($CaSO_4$).
151	0.049	($CaSO_4$).
180	0.27	
200	0.16	

It should be mentioned in this connection that the presence of increasing amounts of calcium chloride and simultaneously rising temperatures decrease the solubility of gypsum in water.

The first reports made on the influence of gypsum and deadburnt gypsum on Portland cement go back to the year 1878, when Schott studied this problem. In this case, the addition of gypsum took the place of the former effect of storage of the cement, in that a film was formed over the particles of cement which prevented the penetration of water. Raw gypsum as well as the burnt variety exerted the same influence, which was weaker only in the case where the dead-burnt variety was employed. The setting-retarding action first appeared when the cement was stored for a more-than-usual period of time, that is thirty-six hours. This was also the first time that the deleterious effect of the presence of more than four per cent of gypsum in the cement was observed. L. Erdmenger determined that the addition of one-half to two per cent of gypsum slowed up the setting of cement and increased the strength of the hardened product. It was also established that the time of set can remain unchanged while an increase in strength can take place, and also that it is possible that the strength of the cement may decrease. Erdmenger described the influence of gypsum as contradictory, while Schott showed that gypsum goes into solution when the cement is mixed with water and sand, and is then again precipitated by the solid substances present according to the surface area of these substances.

The fact is also important that, as far back as 1888, Heintzel took out a patent on the conversion of a rapidly-setting cement into a slowly-setting cement by the addition of calcium chloride.

There are no references in addition to these between the period of 1878 and 1900 on the action of gypsum or anhydrite as a retarder of the setting of cement. In the latter year, E. Jex reported that the amount of gypsum added must be proportioned in such a manner that its conversion into potash alum must be finished before true setting took place; for the increase in the volume of the alum through the addition of eighteen parts of water was not dangerous so long only as the mixture existed in the pasty state. This was the first time that any attempt was made to find a chemical explanation of the phenomenon.

In 1908, A. Moye attacked the problem again and described a Portland cement which set originally in eight minutes, but which did not slow up in setting even though two per cent of gypsum was added. When the same cement was mixed with one per cent of gypsum and heated to a temperature of 200 degrees C, it was converted into a slow-setting cement with a setting time of nine hours. Moye tried to explain this phenomenon by stating that the action of the gypsum was due, not only to the water of hydration in the product, but also to the condition that the resulting plaster of paris ($CaSO_4.0.5H_2O$) possessed a greater solubility than the original gypsum itself.

Somewhat earlier, Tomei reported upon the changes in time of setting when Portland cement is stored, and mentioned that, as far as he could determine, storage of cement affected in no way the time of setting, that is, slowed it down, and that it happened much more frequently that rapid-setting cement could not be made slower-setting even by the addition of gypsum.

Grauer busied himself with the idea of regulating the setting of cement by the addition of gypsum even before Moye came into the picture and

*Tonindustrie Zeitung, 1929, pages 59-61

he attempted to explain the action in the following manner. He claimed that this was principally due to the neutralization of the alkalies in the cement, whose action is due mainly to their slight solubility.

W. H. Kniskern and W. L. Gass conducted experiments which agreed in their results with those of Tomei. They determined that each cement requires a certain specific addition of gypsum and that cements, which have been mixed with gypsum and which again become rapid-setting on storage, can be made slow-setting again by the addition of lime hydrate, but that this compound is inactive on cements which have not been ground with the addition of gypsum.

The important work of F. Hart began in the year 1908. He first determined that, when cement is intimately mixed with water, a salt solution is formed which possesses a strong alkaline reaction. According to his investigations, this solution consists predominately of potassium sulphate, which is apparently formed by double decomposition of the potassium compounds dissolved in the water and the gypsum which has been added to regulate the time setting of the cement. It accordingly appears that the change in the time of setting is due less to the direct action of the gypsum than to the quantity of potassium sulphate which is formed with its help. It was ten years later that Hart attacked the same problem again, and this time he was concerned with the question as to whether gypsum or anhydrite is the more active setting retarder. According to his investigations, anhydrite is considerably less active than gypsum, and he explained this as due to the fact that the solubility of anhydrite in water is less than that of gypsum. It is remarked that this observation is somewhat contradictory to those made by Schott. The fact was brought forward also that gypsum is about 3.23 times as soluble in water as anhydrite.

Hart also worked out a process according to which he was able to establish the proportion of anhydrite contained in gypsum. This research was considered important due to the fact that a mixture of the two materials was often used in place of either one or the other. The method that was worked out was somewhat as follows. One gram of the powdered, air-dried material was heated in a platinum crucible for two and one-half hours at a temperature of 80 to 85 degrees C. The loss in weight entailed by this heating was considered the hygroscopic moisture in the sample. The sample was then heated for an additional three minutes over the Bunsen burner, and then heated for twenty to twenty-five minutes to a dark red heat. The new loss in weight entailed by this heating was considered as the water of crystallization in the sample. Inasmuch as 20.93 parts of water of crystallization are equivalent to one hundred parts of chemically pure gypsum, we have the following: 20.93 : 100 : : Water of crystallization: gypsum content. This gives the gypsum content equal to 100 times the water of crystallization, divided by 20.93.

Later, F. Tippmann interested himself in this matter and reached the following conclusions which he derived from a series of investigations. Swelling or hydration tests with gypsum-containing and absolutely gypsum-free cement gave the result that a definite concentration of lime hydrate in the water was not the cause of swelling or hydration, but rather and exclusively the cause was the presence of the initial gypsum solution. According to Tippmann, the gypsum has a retarding action upon the formation of crystals in the setting of cement, and, on the other hand, a promoting action upon the formation of colloids.

In Germany the Hart Theory—namely, that anhydrite is a less active setting retarder than gypsum—has been accepted; it is only within recent times that this theory has been attacked and by none other than the world-known cement technologist R. K. Meade, and to a certain extent by E. E. Berger.

Meade connects the action of gypsum or anhydrite with the composition of the cement and establishes an index or coefficient of activity which is equal to the percentage of alumina divided by the percentage of silica. Cements in which the index lies under 2.5, are rapid-setting, while, when the index lies about this value, slow-setting cements are formed. On the other hand, if the hydraulic modulus is greater than 2.0, then rapid setting need not be feared even when the aforementioned coefficient is less than 2.5. This conception is substantiated to a certain degree by the facts that each cement reacts differently towards gypsum and that each cement demands a specific addition of setting regulator.

It is further stated that the crude gypsum which is added to the cement during its manufacture enters into reaction only in the water-free state, for the reason that water is split off due to the temperature of the clinker as well as during the heating which is engendered during the grinding of the cement. Naturally occurring anhydrite differs from that obtained from crude gypsum in that it has a greater affinity for water. While the former combines with water only when it is very finely ground, the latter easily combines with water.

Practice has shown that the use of crude gypsum which contains, for example, forty per cent of anhydrite, affects the setting, retarding it to the same degree as when crude gypsum is ground alone with the cement.

Accidents Cannot Be Totally Eliminated by Mechanical Means

The Author States That 75 Per Cent of All Accidents Are Caused by Negligence, Carelessness and Disobedience

By THOMAS J. QUIGLEY*

Chief of Mines and Quarries Section, Department of Labor and Industry Section, Harrisburg, Penn.

WHAT I am going to say on accident prevention work, particularly in the quarry industry, is based upon my knowledge, my observation, my examination of over 200,000 accident reports received upon my desk in Harrisburg, upon information which I have obtained from the Department of Mines in Washington and from insurance companies.

I want to go on record and say that the statistics of the United States Government of the Department of Labor and Industry of the State of Pennsylvania proves conclusively that 75 per cent of all accidents which occur in industry are preventable.

No amount of money invested by industrial managers for mechanical means of safeguarding machines and dangerous devices can prevent these 75 per cent of the accidents which occur.

The prevention of the 75 per cent of all accidents which occur annually in the industrial establishments of this great nation is entirely in the hands of the men themselves, I mean in the hands of the workers. In addition to that, I want to say that management is responsible for the prevention of accidents and it is up to the management to educate the men to prevent them. I said that no amount of money could eliminate the 75 per cent of accidents, and I will prove it to you.

Most of you realize the hazards and the dangers of unguarded machinery of electricity, of open switches and the use of explosives. If we had only explosives, electricity, open switches and unguarded machinery, we would have a wonderful record for accident prevention. But this 75 per cent which cannot be prevented through mechanical means of safeguarding is the greatest curse for which our works and our industry are suffering. The five causes are, Hand tools, Handling material, Falls of material, Falls of persons and Cars and locomotives such as used in the quarrying industry is five.

No mechanical safeguard can protect a man in using a hand tool, if he has a broken handle on a hammer, stone fork or a shovel. No amount of money spent for mechanical safeguards will keep the locomotive or cars on the track if it is not in proper condition. No amount of money invested will protect a man from tripping, stumbling and falling. The only way you can prevent accidents from falls of material at the face is by proper inspection of the face and by properly cleaning down the loose stone which hangs upon the face. No amount of money invested in safeguards is going to save a man at the foot of an 80, 90 or 100 foot face, if the men working on the top, removing the overburden with the steam shovels, turn the top down on him, which frequently occurs.

That, is why I say that the 75 per cent of the accidents which occur must be eliminated through the men themselves. And only through proper education can those accidents be eliminated. When you talk about accident prevention, a great many people get it into their heads that, "Now here is a fellow coming along and he is going to ram us to get something and make us spend a barrel of money. Here is some other fellow from college or some politician who got a job, and he is going to make us spend a lot of money." That is the furthest thing from the truth. Why, you don't have to spend a dollar to get real accident prevention results.

If the president of the company, the general manager of the company, the superintendent of the company, and the foreman of the company is a real, honest-to-God advocate of accident prevention, if he stands 100 per cent for accident prevention and if he will use his God-given senses, his eyes to see, his ears to hear, his brain to think, and his tongue to speak, as he goes through the quarry, every day, you will eliminate all of your hazards.

When you walk through the quarry and you see a man doing some dangerous work, when you see a dangerous practice, you see a violation of the safety laws or the safety regulations. Stop it right then and there! When you come along and you see that your track is not in proper condition, correct it. When you see a man working under a loose face, take him out of there; take down that loose face before it falls on him. When you see a man working with a broken handle on a hammer, stone fork, pick, or shovel, stop him; send the tool and get it fixed.

*"Abstract of an Address," "How to Prevent Accidents in Quarries," presented before the safety section of the National Crushed Stone Association, Cleveland, Ohio.

When you see a man raking away and digging away and ramming away with a bum tool, say for instance, a spike bar, trying to pull a spike and you know he can't get under the head of that spike in an hour because it is not in proper condition, he will then go and get a hammer and try to drive it under, and he can't get under it, send him to the blacksmith shop. Get that bar sharpened. That man then can pull spikes. He can give you a return for your money, and he can eliminate accidents.

When you go through your quarry and you see men riding between the loaded cars, where they have no business, when you see men riding on the loaded cars on the incline plane, where they have no business, when you see men breaking stone without their goggles, in violation of law and in violation of safety regulation, stop it.

Again, I say that 75 per cent of all accidents which occur annually in the industrial establishments of this country, whether it be mines, mills, factories, shops, or quarries, can be prevented if the management of the companies will stand back of the movement 100 per cent and demand compliance from the workers.

But when you get a man that has a wishbone instead of a backbone, and he is in charge of that plant, you are going to have accidents, and you can't have safety.

Now I am going to mention a subject, in which I know you are all interested—MONEY. I will give you the figures of the State of Pennsylvania for 1928. In 1928, $270,000 was awarded in compensation to injured workers in the quarrying industry in Pennsylvania. According to the insurance actuaries' figures, at least $5 in addition is spent for every accident, incidental expenses which are not charged up to compensation. On that basis, $1,600,000 was paid out in the commonwealth of Pennsylvania in 1928 for accidents in quarrying industry, and upon that basis, over $20,000,000 was spent in the United States of America by the quarrying industry for accidents, and 75 per cent or $15,000,000 could have been saved by the quarrying industry and could have been paid to the stockholders as dividends instead of being paid out for compensation to doctors, nurses, hospitals, X-ray, operations, and that class of expense.

I want to go on record, by saying that you don't have to invest a dollar to accomplish real accident prevention results. Use your personnel; use the men to whom you are paying your money; use your plant manager, superintendent, and foreman, and make them render the 100 per cent service for which you are paying them. And if that is done, accidents will come down; dividends will increase, production will increase; and the cost of production will decrease.

One man operates eight quarries in Pennsylvania and averages about 350 to 450 lost-time accidents per year. He averaged from 30 to 40 accidents every month. I finally succeeded in interesting him in accident prevention work, and here is the result of his experience: He started in last May on an accident prevention drive, and compared with May of 1927, reduced accidents 12 per cent. In June he showed 24 per cent reduction; in July, 48; in August, 64; in September, 88; and in the month of October, with a thousand men on his payroll, he didn't have a lost-time accident.

Does accident prevention work pay? Now what did it cost that man to bring his accident records down from 30 to 40 per month to nothing? It cost him a banquet for his executives, at which he told them they either had to cut out the accidents or get off the pay roll. That is what it cost him. He didn't hire any experts. He didn't put on any additional men. He simply took the men that he was paying and said, "Render to Caesar the things that are Caesar's, and give me what I am paying you for." He got it.

There are many other companies that could be mentioned. Take the record of the General Crushed Stone Company. Your retiring President, Mr. Graves, has left a monument to his memory, by operating one of his quarries for eighteen months without a lost-time accident. What greater thing could he leave you? What better monument to his memory could he leave behind? As President of the Association, he set an example to prove to you that accidents are not necessary in the quarrying industry. Two weeks ago I attended a safety meeting of the John T. Dyer Quarry Company, at which a trophy was awarded to one of its quarries operating during 1928 without a lost-time accident.

The Portland Cement Association is the most outstanding individual organization in America for accident prevention work. I know of no other industry in the United States that is more actively engaged in accident prevention work than the Portland Cement Association. I believe that the National Crushed Stone Association has men who are mentally and in every other way equal to those engaged in the cement business. There is absolutely no reason why you men should not go on record 100 per cent for accident prevention work and place your industry where it properly belongs. There is no reason why you can't equal or surpass the records made by the Portland Cement Association if you will only go into this business with a determination that accidents must cease.

In the State of Pennsylvania we reduced the fatal accidents in the quarrying section last year 28.9 per cent, and we reduced our non-fatal accidents 5 per cent. That shows a reduction of 400 lost-time accidents as compared with 1927, and showed 13 less fatal accidents as compared with the previous year.

Brandon Lime and Marble Company Rebuilds Plant

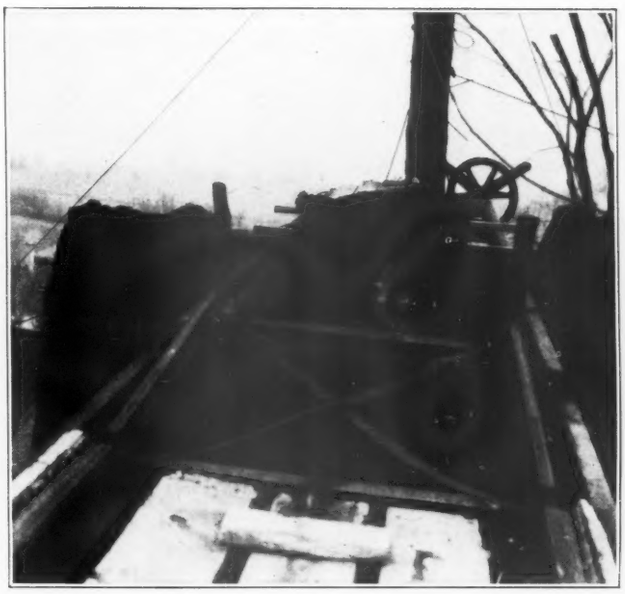
Lime Burning Operations Which Were Destroyed By Fire Were Restored In Record Time

By GEORGE RANSOME

THE plant of the Brandon Lime and Marble Company of Leicester Junction, Vermont, in the Champlain valley has been entirely rebuilt during the last four years as a result of two fires. The first of these fires occurred four years ago when the kiln house burned, and the other fire happened two years ago when the building which housed the compressor, hoist and repair shop was destroyed. When these were rebuilt, they were completely modernized and a very good job was made of the work and consequently the plant now presents a first class appearance and is, in fact, a very good one for a small operation.

It has been running for nearly a hundred years and has been in the Huntley family between fifty and sixty years, having been purchased as a going concern of many years' standing by the present Mr. Huntley's father when a young man, who died several years ago at the age of eighty-two. His son has now been in active charge of the business for from fifteen to twenty years.

With all this experience and practical background, it is interesting to see what a profitable property has been created. The operation has been carried on for so long a time that the original quarry, which came to cover a large area, has been abandoned and a new one started. This also is now large, with a long face 85 feet high. Although it is well adapted for the use of well drills, the production is not large enough to warrant them, so the drilling is done in benches with Ingersoll-Rand jack hammers and the blasting with 30 per cent Trojan dynamite.

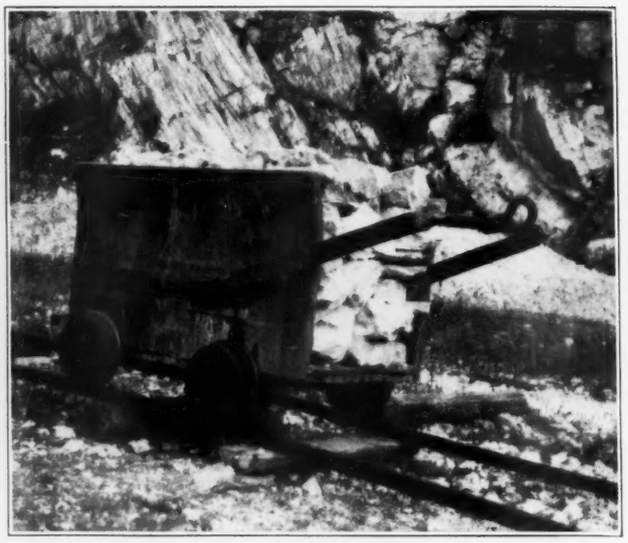


Car-Dumping Tipple, Above Kilns

A very unusual feature of the quarry is the peculiar formation of the rock with the stratification in some spots almost in circles. The stone is picked

Store House (Left), Kiln House (Center), Kilns (Right)

Quarry Face, Showing Distortions in Structure



End-Dumping Quarry Car

over by hand and thrown into home-made wooden dump cars lined inside with sheet iron. These cars are pulled along a track by horses to the turntable at the foot of the incline to the top of the kilns. Here the cars are turned and hauled up the steep grade by means of a single drum Lidgerwood hoist, where they are automatically dumped by means of a turned-up rail.

This brings us to the hoist house. As previously stated, it also contains other machinery as well as the shop and was built two years ago when the old one was burned. There may be an impression that quick restoration of normal conditions is impossible outside of the great industrial centers where everybody is keyed up to a high pitch and where every facility is at hand for quick action. Probably less people think that of Vermont now since its phenomenal recovery from the devastating floods of just a year ago, but even two years ago it took only two weeks to get the plant going again after the building containing most of its machinery burned.

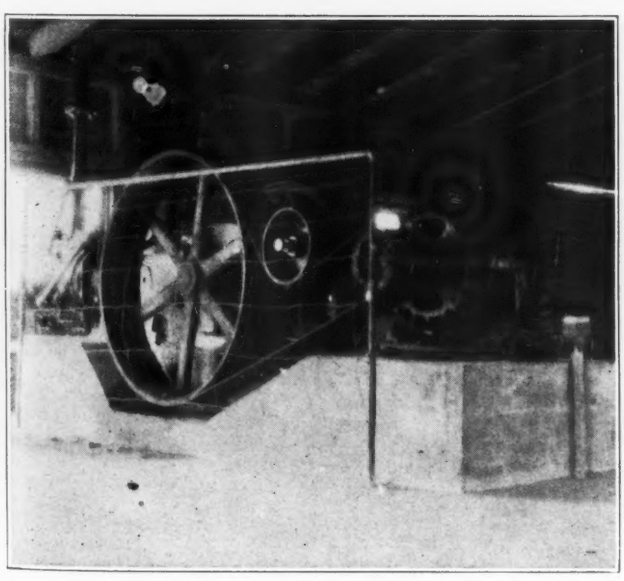
The new building is 50 by 70 feet in size, with a concrete floor. The hoist itself is the same one that went through the fire with little or no damage. It is kept in such good condition, as is everything in the whole plant, that it looks like new. The air compressor is an Ingersoll-Rand driven by a 20 hp. Fairbanks-Morse motor, both mounted on

Inside Kiln House, Showing Lime-Drawing Floor, With Firing Floor Above

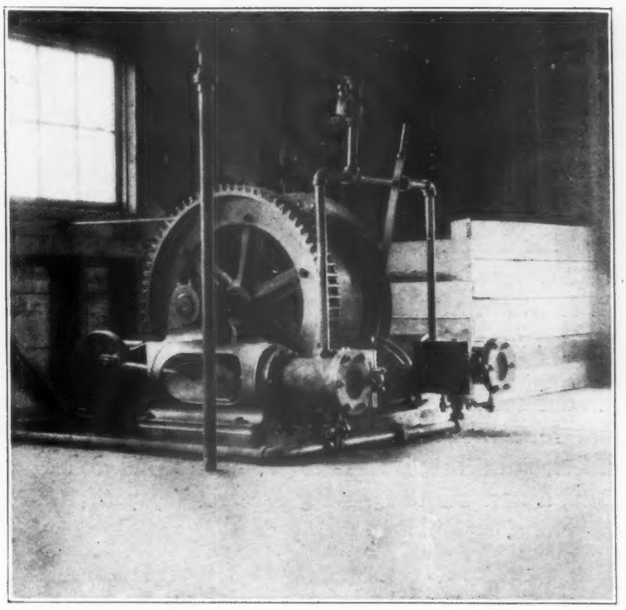
a substantial concrete base raised above the floor. This compressor also went through the fire without injury, probably because it was running at the time and the water jacket saved it. Compressed air is used to operate both the drills in the quarry and the hoist, for reasons of economy. With only one motor, the minimum demand charge by the power company is only $20 per month. If a separate motor were used for the hoist this charge would be proportionately higher, and as the hoist is in operation at only comparatively infrequent intervals, when the kilns are being charged, the supply of compressed air is adequate and this extra expense is saved. Advantage has merely been taken of operating conditions more or less peculiar to this plant which doubtless may be duplicated in some others. At any rate, to take advantage of existing local conditions is fundamental to good management and certainly provides considerable food for thought.

This new building also contains a Lancaster drill press and a forge with a Champion blower. This part of the shop is also used for shoeing horses, which are still used for a variety of purposes, especially in winter, in this region. The extreme neatness of this building, as well as of the whole operation, shows that Mr. Huntley meant what he said when he made the statement that he cannot take pleasure in his work if it is carried on in sloppy surroundings.

There are two kilns in which coal and wood are burned. Their production is about 20 tons each per day. Lime burning is not the only activity of the busy Huntley family. Telephone poles and railroad ties are also cut by them during the winter and the waste from these is used in the kilns, together with some wood specially cut in the swamps. The lime is sold mostly to the paper and tanning industries and is shipped exclusively in barrels. They



Motor-Driven Compressor Unit



Hoist Operated By Compressed Air

are weighed on a Howe scale on the drawing floor.

The kiln house and adjacent store house are also new within the last four years, as already explained. The kiln house is built of wood framework with galvanized corrugated metal sheathing. The wooden roof stringers are supported by old railroad rails which have been placed in such a manner that only two wood posts aside from the side walls are required to hold them up. In case of another fire the roof is sufficiently high, it is felt, to escape damage and it is also believed that there is a fair chance to save the good pillars from burning, which means that in all probability the building itself is reasonably safe. The floor, on account of its irregular shape, is covered with flat sheet metal having standing seams so as to prevent water from melting snow, which does not run off so rapidly in some of the flatter spots as in others, from dripping through the seams and dropping on the burned lime below.

The storage house is operated from the kiln house by the siding from the Rutland Railroad. This also has corrugated metal for the roofing and for the side toward the kiln house for fire protection. The other three sides are of wood, nicely painted, which present a very good appearance from the main highway. All of this metal sheathing was obtained from the Strong Hardware Company of Burlington, Vermont.

The railroad siding was constructed in comparatively recent years. Formerly the barrelled lime was trucked to the station which is only a few hundred yards away, but it required the services of two men, a pair of horses and a truck to do it, working practically full time. These have been eliminated since the siding was run in and as it is a short one the investment was profitable.

Lime and Stone Company at Saginaw, Alabama Completes Modern Addition To Its Lime Plant

THE Saginaw Lime and Stone Company of Saginaw, Alabama, operates what is probably the largest and most complete plant in the state devoted entirely to the manufacture of lime. Its location, about 25 miles south of Birmingham on the Birmingham-Montgomery Highway, is in the heart of the Shelby County district which is famous for its white lime. The plant with its original four brick kilns was first built in the early nineties and the four steel gas-fired kilns added in 1928, a new building being erected adjacent to the older one.

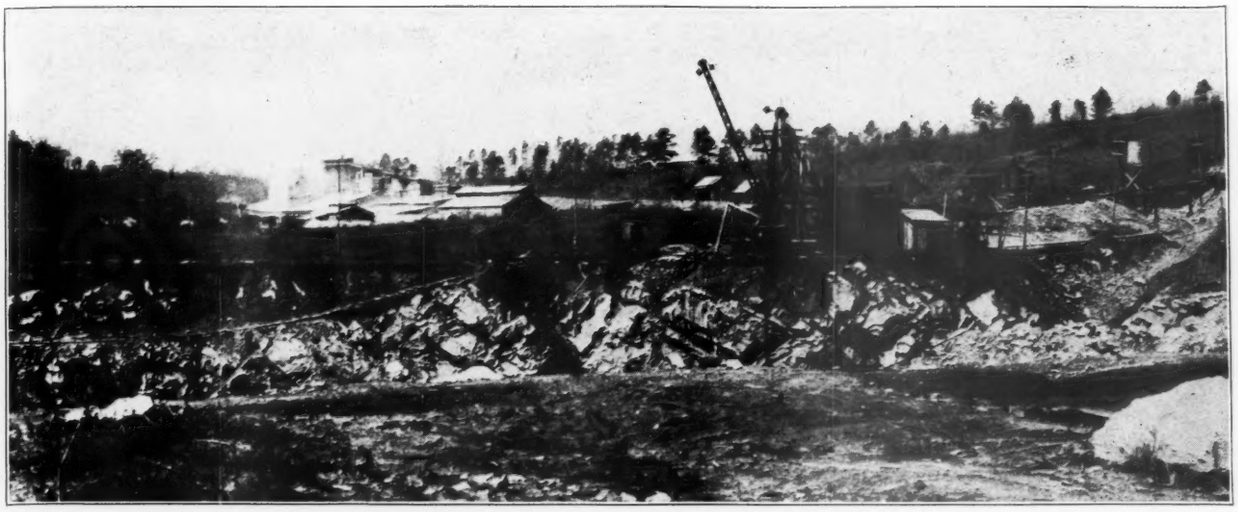
Self-Drawing Conveyor at No. 2 Brick Kiln

Quarrying Operations

The quarry, which lies about 1,200 feet north of the plant, is in a deposit of the high calcium limestone which has made this part of the state famous for its lime. The stone is of rather massive formation, in layers from five to fifteen feet in thickness, the deposit having a dip to the northward of about 50 degrees.

The overburden varies in depth, the stone being exposed in places, but averages about 8 feet. Most of this is removed with a ¾-cubic yard Erie steam shovel and a ½-cubic yard Keystone excavator and

View in Quarry from South. Waste Dump in Background. Derrick for Hauling Stone from Sump at Left

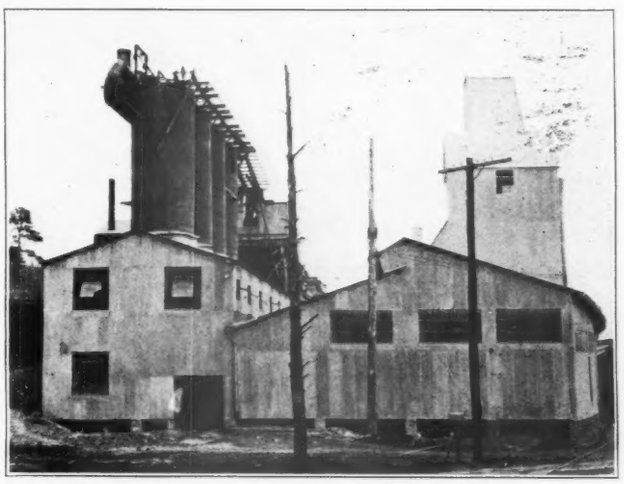


View in Quarry, with Plant in Background

hauled away in dump cars, but because of the irregularity of the top of the deposit only a part can be removed in this manner. The remainder is shoveled into wheelbarrows and dumped at some distance from the quarry.

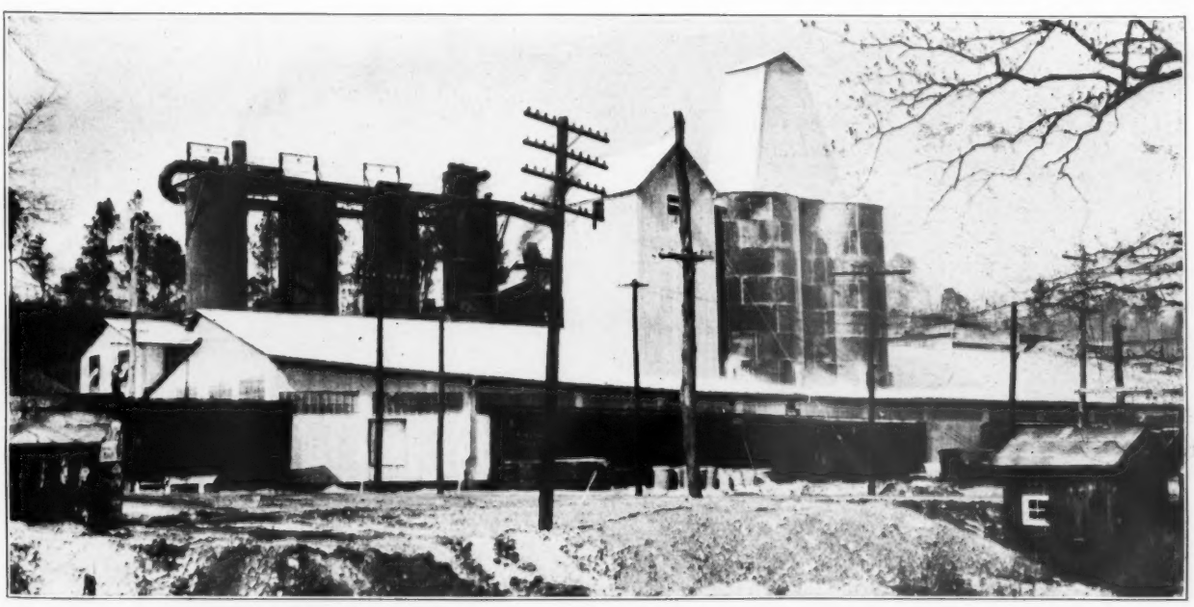
Drilling is done with two Ingersoll-Rand jackhammers using drills up to 16 feet in length, the 50-foot face being shot down in three steps. Du Pont 40 and 60 per cent dynamite is used and is detonated by either electric current or battery. A second level about 20 feet deep was started six months ago and is gradually being enlarged to the size of the quarry.

The stone is loaded by hand into 2-cubic yard capacity 36-inch gauge Koppel steel side dump cars and hauled to the kilns in trains of five cars each. The cars are hauled up the incline from the quarry and to the top of the kilns, a distance of about 1,500 feet, by a hoist at the plant which is driven by a 75 hp. electric motor. Roebling cable

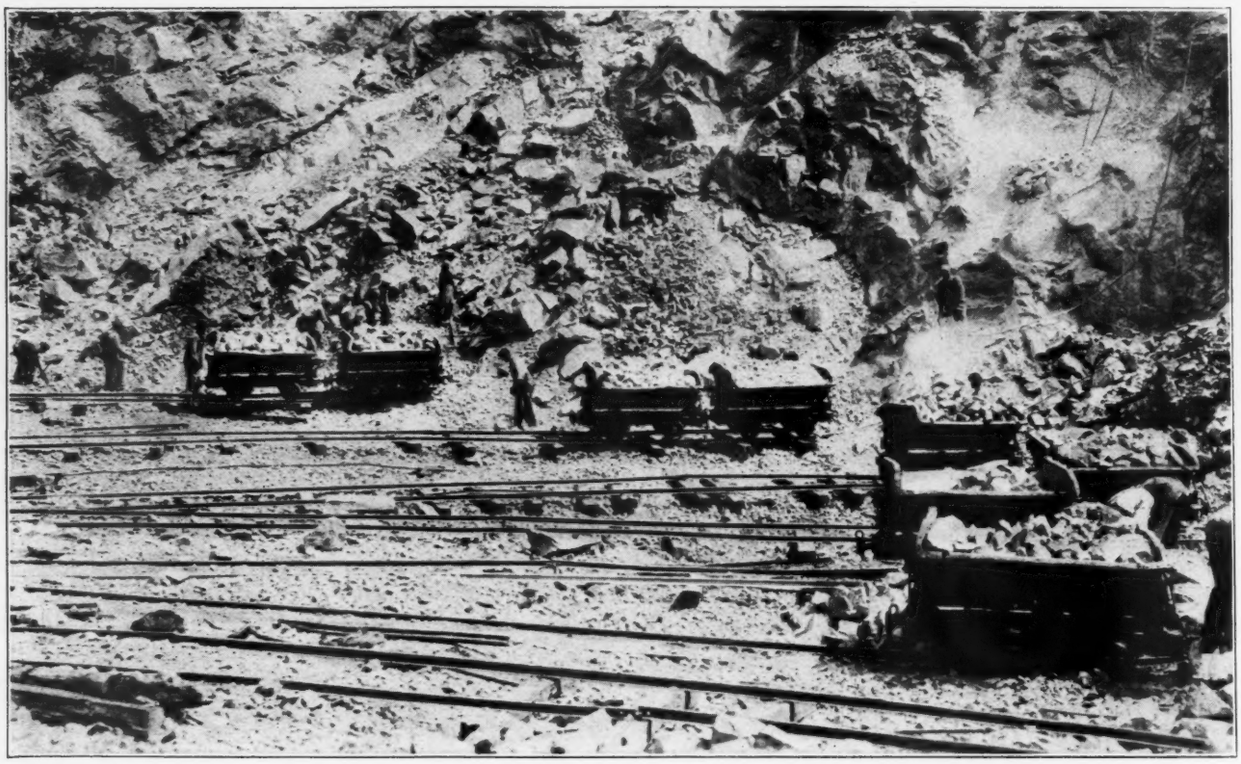


View of Plant from West

is used. Horizontal and vertical rollers at each curve and change in grade keep the cable from whipping and make this method of haulage prac-



View of Plant, Showing Four New Kilns at Left, Two Storage Tanks at Right

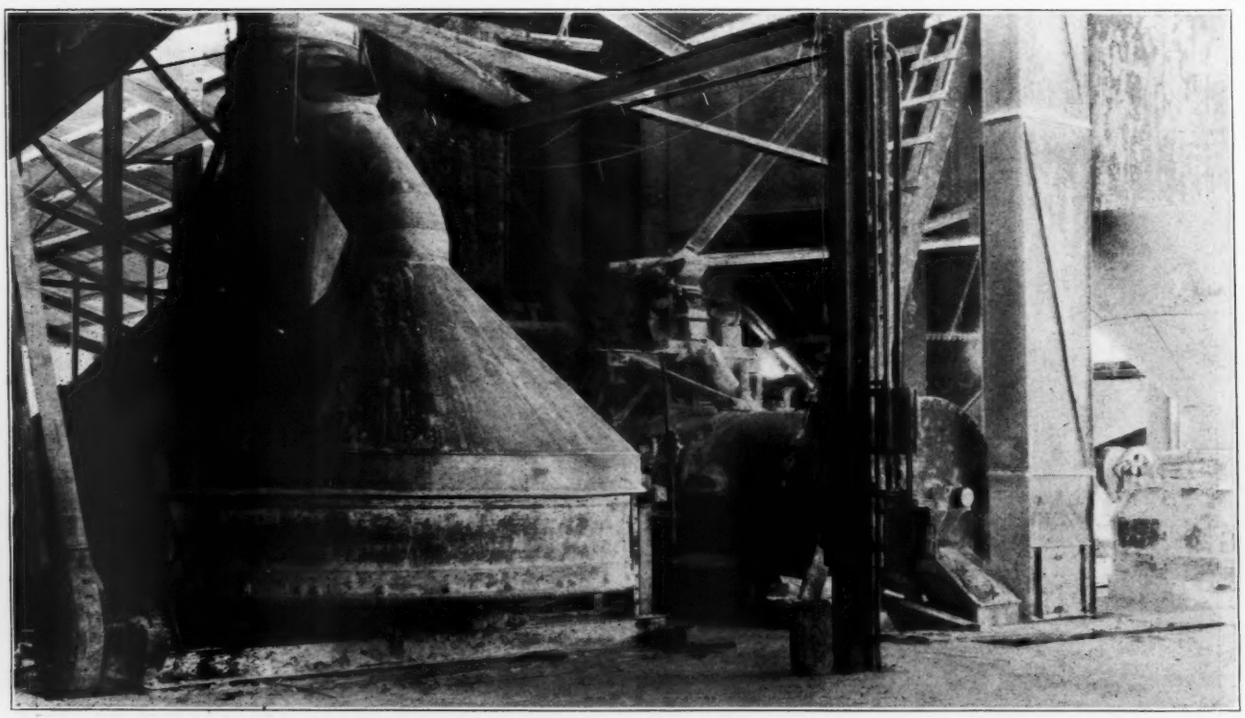


View in Quarry, with Jackhammer Drilling, Cars Being Loaded

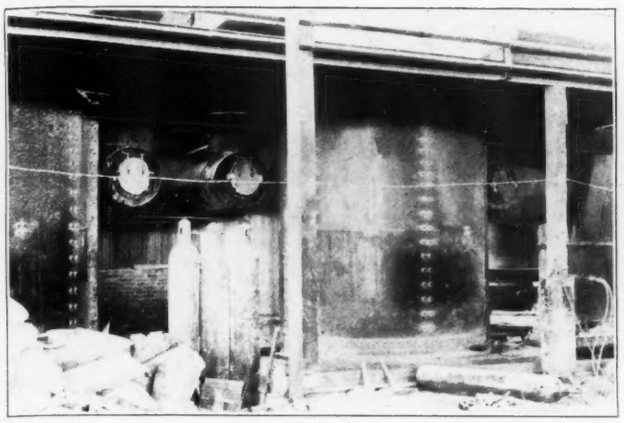
Saginaw Plant from Southwest

ticable. The empty cars are returned the entire distance by gravity.

The quarry drains into a large sump in one corner from which the water is removed by a 6-inch Dayton-Dowd centrifugal pump and a Cameron steam pump, the latter being used only when sinking the sump. The stone excavated in sinking the sump is hoisted by a derrick driven by a



Clyde Hydrator (Left), Schulthess Hydrator (Center), Bates Bagger (Right)



Base of One New Kiln, Gas Producer Firebox at Right

Men Picking Lime on Cross-Conveyor Feeding Crusher

35 hp. electric motor, the body pan of one of the dump cars being used as a skip bucket. The waste stone from the quarry, as well as the overburden, when removed by mechanical means, is hauled in quarry cars up an incline to a dump. Hoisting is done by a Flory hoist driven by a 50-hp. electric motor. Air for the drills is furnished by an Ingersoll-Rand 12-in. by 10-in. air compressor driven by a 50-hp. motor. An Ingersoll-Sargent 14 in. by 20-in. compressor driven by a 35 hp. motor is used as an auxiliary. Water for the air compressors and for the boiler at the plant is furnished by a triplex pump.

Kiln Operations

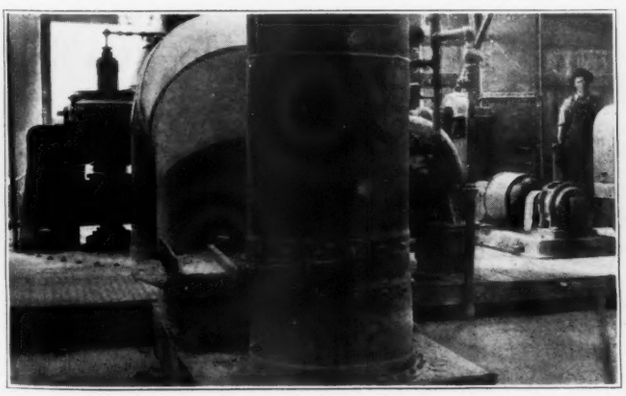
The four original kilns are of brick with an inside diameter of 8 feet and a height of about 40 feet. These were built when the original plant was first put into operation in the early nineties. They are hand-fired with coal and hardwood. Lime is drawn from these kilns by Jeffrey drag chains each of which is driven by a 7½-hp. motor. Each of these kilns has a capacity of 14 tons in 24 hours. The lime, discharged from the kilns, is loaded into wheelbarrows and taken to the new building where it goes through the same processes as the lime from the newer kilns.

The new addition to the plant was completed in 1928 although installation of some of the equipment is not yet completed. The building has a structural steel framework with corrugated steel siding and concrete floors, foundations and pits. The four steel kilns were originally part of the plant at Longview which is being operated by the same company under the name of the Longview Lime Works. They were brought to the new plant last year and enlarged to their present size which is 6½ feet in interior diameter and 60 feet high.

Gas-Fired Kilns

These kilns are fired with gas which is produced by an R. D. Wood heavy duty gas producer with a capacity of gasifying 2½ tons of coal per hour. It is now operating under a light load as it is planned to also equip the brick kilns to burn gas, the producer having been installed with this in mind. The kilns are equipped with an induced draft system operated by a Buffalo 80-inch fan driven by a 10 hp. electric motor. Each kiln is equipped with a damper for regulating the draft. The gas producer is operated by a small electric motor driving through a W. A. Jones speed reducer.

The coal burned in the producer is of a higher grade than that used in the ordinary coal-fired kiln and is shipped in from nearby mines in rail-



Gas Producer, with Drive at Right

New Level in Quarry, at Left

Clyde Hydrator (Left), Schulthess Hydrator (Right)

road bottom dump cars. These discharge into a track hopper from which the coal is elevated by a Caldwell bucket elevator to a 60-ton capacity bin over the gas producer. The producer is fed from this bin by an automatic coal feeder.

Drawing and Crushing Lime

The steel kilns are drawn by shear gates which discharge onto a 36-inch Jeffrey pan conveyor running under the kilns. This conveyor in turn discharges onto another inclined 36-inch Jeffrey pan conveyor, operating at right angles to the first, which discharges into the crusher. Stone from the brick kilns is also dumped onto this conveyor and all of the lime is picked over and broken to crusher size by two men stationed there for that purpose.

The conveyor discharges into one of two duplicate Sturtevant No. 1 gyrating crushers, only one of which is operated at a time. Each of the crushers is driven by a 10 hp. electric motor through a Link-Belt silent chain drive. The crusher discharges into an 85-ft. center steel enclosed Jeffrey chain elevator, driven by a 7½-hp. motor which, in turn, discharges onto a grizzly screen. The oversize from this screen goes to two storage bins of 4,000 bbl. capacity each, while the material passing through the screen goes to the 100-ton capacity steel hydrator bin.

Crushed bulk lime is drawn directly from the two storage bins onto a Link-Belt box-car loader which loads into cars. Barrel and bag lime is drawn from the same bins and loaded into the cars on hand trucks. All barrels and bags are weighed on Fairbanks 600-lb. capacity platform scales. Lump lime is shipped in steel drums, moisture-proof paper-lined jute bags, multi-walled all-paper bags and in wooden barrels.

Lime Hydration and Packing

The lime, at present, is being hydrated by a Schulthess standard 2-ton hydrator equipped with a McGann hammermill and a Gayco air separator. Two 10-ft. Clyde hydrators which are now being installed will give a total capacity of 6 tons of hydrated lime per hour. These will be in operation within a few days. One reason for installing these new hydrators is so that a higher grade of lime can be produced by allowing it to remain in the hydrators a longer time than formerly.

The Clyde hydrators discharge by gravity into a 10-ton capacity steel bin from which a Jeffrey bucket elevator feeds the lime to the same separating system previously mentioned. The separator discharges into a 75-ton capacity steel hydrate bin which feeds a Bates 4-tube bagger. Loading into cars is done with hand trucks.

A complete cooper shop is maintained at the Saginaw plant and here all barrels used at the plant are assembled. Holmes barrel-making machinery is used, all electrically driven. A well equipped blacksmith shop is also maintained in which all minor repairs are made. Water for all operations and for drinking purposes comes from a deep well and is pumped by an A. D. Cook pump driven by a 7½-hp. electric motor.

A well equipped commissary across the highway from the plant is maintained by the company for its employes. The stock consists of almost everything that might be needed from groceries to shoes, hats and dress goods. Most of the 100 employes and their families live in company owned houses in the vicinity of the plant.

J. B. Adams, president and general manager both of the Saginaw Lime and Stone Company and the Longview Lime Works is one of the pioneer lime manufacturers of the South, having operated the Longview plant for more than 40 years. This plant, which is about three miles south of the Saginaw plant, is probably the oldest operating plant in the South today. It was also one of the first to be equipped with a complete hydrating system. Mr. Adams maintains his office at this plant, leaving the management of the Saginaw plant in the hands of the superintendent, W. C. Stewart.

The Cement Trade in Morocco

Owing to the new buildings being constructed in most of the towns of Morocco, and especially in Casablanca, Rabat and Fez, there is a great demand for cement. Extensive works are also planned both for railways and for the improvement of the ports so the present consumption of cement cannot decrease, and is even likely to increase.

The cements utilized in Morocco are to a great extent produced in the country. A company in Casablanca sends its cement to all the home markets, and there is a competition with imported cements from France, and, also to a slight extent, Belgium, Italy and Czecho-Slovakia. Most brands are represented in the markets.

Safety Methods in Handling and Using Explosives in Stone Quarrying

By H. M. HAMILTON
Representative E. I. Du Pont De Nemours & Co.

THIS is a subject that not only deserves, but demands the utmost thought and attention by all of those having to do with the handling, transporting and use of explosives. This is a subject in which the employer from the front office down the line should take a keen and determined interest to the end of seeing that all employees who handle, transport or use explosives are properly instructed in safe methods and that all known safety rules and precautions in this regard are properly obeyed. It is difficult to formulate safety rules that will cover each condition, therefore, it behooves the employer to make sure that those employees using explosives thoroughly understand the character and nature of the material they are handling and that carelessness and negligence must be positively eliminated.

It is a known fact that many commercial high explosives may be exploded by severe and prolonged friction. It is also true that some explosives are more inflammable than others. However, treat them all as dangerous high explosives —take no chances, make no experiments, as they give no warning and allow no time to reach a place of safety in event of a premature explosion.

Smoking around explosive magazines, while transporting or loading a blast is dangerous and should be prohibited. I have seen men smoke while loading a shot.

Just a few days ago I was asked to help load a blast. I had three men working at one hole, one loading the hole and two using the tamping stick. I walked some distance away looking over the other holes and when I returned one of these men was smoking a pipe and one a cigarette. Near these men were three other men working and a few yards further other men were working carrying dynamite and stemming material. If an accident had occurred at that particular time, it would no doubt have resulted in the loss of four to ten lives. Therefore, make rigid safety rules governing the use of explosives.

When loading holes, particular attention should be given to any other work that may be going on nearby in which there may be steam shovels and locomotives operating that may throw sparks into the dynamite. Electric wires in a quarry are another source of danger. Look out for stray currents.

H. M. Hamilton

A wood tamping stick should be used in tamping explosives in bore holes. A hollow pipe with a block of wood driven in one end is dangerous. For tamping deep well drill holes, a block of wood some 4 inches in diameter and 3 feet long with rope attached is the most popular and is considered safe so long as it has no metal parts.

Dropping large size dynamite sticks into well drill holes is a common practice in loading deep hole shots. Although this method is looked upon as being safe, still some quarries with extremely deep holes employ other means of lowering the sticks. One simple method is a pointed hickory stick with eyelet in end, in which rope is tied. The stick is forced into the end of the dynamite, lowered in bore hole and stick is jerked out.

In loading shots, when electric detonators are used to set off the blast, each detonator should be tested before and after it is loaded. Ends of wires should be scraped to remove all foreign material. Connections should be tight and secure. After all connections are made, the entire circuit should be tested before attaching to blasting machine or power circuit.

In using Cordeau-Bickford as a detonating agent instead of electric blasting caps, extreme care should be exercised to see that it is not broken or mashed and that proper and secure connections are made as there are no means by which these connections may be tested.

Should one or more holes fail in a shot, it not only means a loss to the company but creates a hazardous, dangerous condition, in that, unex-

(*Continued on Page* 78)

*Abstract of paper read at Regional Safety Meeting, Portland Cement Association, Louisville, Kentucky, March 5, 1929.

United States Gypsum Company Completes the First of Four Projected Metropolitan Plants

AS THE engineering department of the United States Gypsum Company has built literally dozens of gypsum mills during the past twenty-five years, it was anticipated that the company's four new metropolitan plants which it has been building at Boston, Philadelphia, Chicago and Detroit would be masterpieces of design and construction. Whether this assumption has been fulfilled may now be judged from this description of the Boston plant, the first of the quartette to be completed. The plant is situated at Mystic Wharf, Charlestown, Massachusetts, on the Boston & Maine railroad, and it was first put in operation on March 9.

The plant consists of three main units—the calcining mill, the warehouse, and the board and block plant. The calcining building is 80 feet by 230 feet and is of various heights. The warehouse is 40 feet by 260 feet, and the board and block plant, 40 feet by 470 feet, both of these buildings being uniformly three stories in height.

Very heavy steel and concrete construction has been used. The outer walls are of brick; the floors are designed to carry a load of 600 lb. per sq. ft.; and the roofs are of the company's own 3-in. by 12-in. by 30-in. Pyrobar solid roof tile, laid on special bulb tees and protected by a twenty-year tar and gravel Barrett Specification roof covering.

In the warehouse and the board and block plants are two large 16,000-lb. H. S. Payne Company elevators, with platform 8½ feet by 18 feet; also a smaller elevator of the same make. Between the warehouse and the board and block plant are two main loading tracks, entirely roofed over, the roof partly glazed with corrugated-wire glass.

Construction work was under the management of the Morton C. Tuttle Company, Boston, which handled all sub-contracts subject to the approval of the owner. Steel was furnished by the New England Structural Steel Company of Boston.

The plant is electrically operated, the power being furnished by the Charlestown Gas & Electric Company through the United States Gypsum Company's own transformer stations. Three large Maloney transformers are employed, the power used being 60-cycle, 3-phase, 440-volt alternating current.

Practically every piece of equipment is driven by individual motor, either direct or through Farrell Birmingham spur-gear type speed reducers and Cleveland worm-gear reducers. All motors, with the exception of the Westinghouse synchronous motors, are Allis-Chalmers ball-bearing motors, of the totally enclosed type.

On the Mystic river the company has constructed a wharf, equipped to unload the company's four steamships, especially designed to handle the raw gypsum from the quarries. The Mead-Morrison steam unloading crane is capable of entirely unloading and cleaning out one of these 6,000-ton ships in twenty-four hours. The crane is equipped with a large grab bucket, which conveys the rock from the hatches of the steamships to a hopper attached to the unloading crane. From this hopper the rock is drawn out with a feeding belt, discharged onto a rubber conveyor belt on the dock, and carried over an automatic Merrick Weightometer. From here the rock is discharged into a large continuous-bucket inclined elevator, which elevates it to the top of the huge concrete silos, where it is carried by means of a Robins Conveying Belt Company's shuttle belt conveying and distributing system to any one of the concrete storage silos. (The Robins company also supplied the conveying system on the dock and those used in the mill.)

New Boston Plant of the United States Gypsum Company at Mystic Wharf, Charlestown, Mass. At Left Is the Board and Block Plant and at Right is the Warehouse. Between These Buildings Are the Covered Tracks

Under these silos and extending their full length is a large tunnel, in which reciprocating cars feed the rock from the bottom of the silos to conveyor belts; the belts carrying the rock to an inclined open-top carrier, which elevates the rock and discharges it on a live-roll grizzly, where the fine material is separated from the coarse. The coarse material from the grizzly discharges into a crusher, which breaks the rock down. This crusher discharges into a continuous-type bucket elevator, which elevates the rock over two steel storage bins, each of 500 tons capacity. A shuttle conveying and distributing belt system assures the bins being filled uniformly and to maximum capacity.

The rock for the kettles is first drawn from one of the 500-ton steel bins through a system of feeder cars and belt conveyors into a rotary rock dryer, where the surface moisture is removed by means of oil fuel. The rock is then discharged on a steel inclined carrier, thence into a continuous-type bucket elevator, thence into a Hum-mer screen, which removes the fine material. The oversize rock is put through a swing-hammer mill and, after being reduced, is returned to the stream.

From here the rock goes into an air separator, the fines from which are elevated and conveyed by screw conveyors to the land-plaster bins over the kettles. The coarse rock from the separator is discharged into a steel bin, from which it is fed into a pulverizing mill, equipped with a fan and air-separating system which picks up the material when ground to the proper fineness and discharges it by air into the land-plaster bins over the kettles.

The kettles are of the company's own standard design and are equipped for use with oil fuel. The stucco from the kettles is discharged into hot pits from which it is drawn through a drag-chain conveyor and a system of bucket elevators and distributed by screw conveyors to the various steel bins in the warehouse, or to the concrete storage bin at the board and block plant.

The warehouse is equipped with several one-ton mixers with four tube Bates packers, a separate packer, and also a specialty mixer. There are in addition several barrel packers.

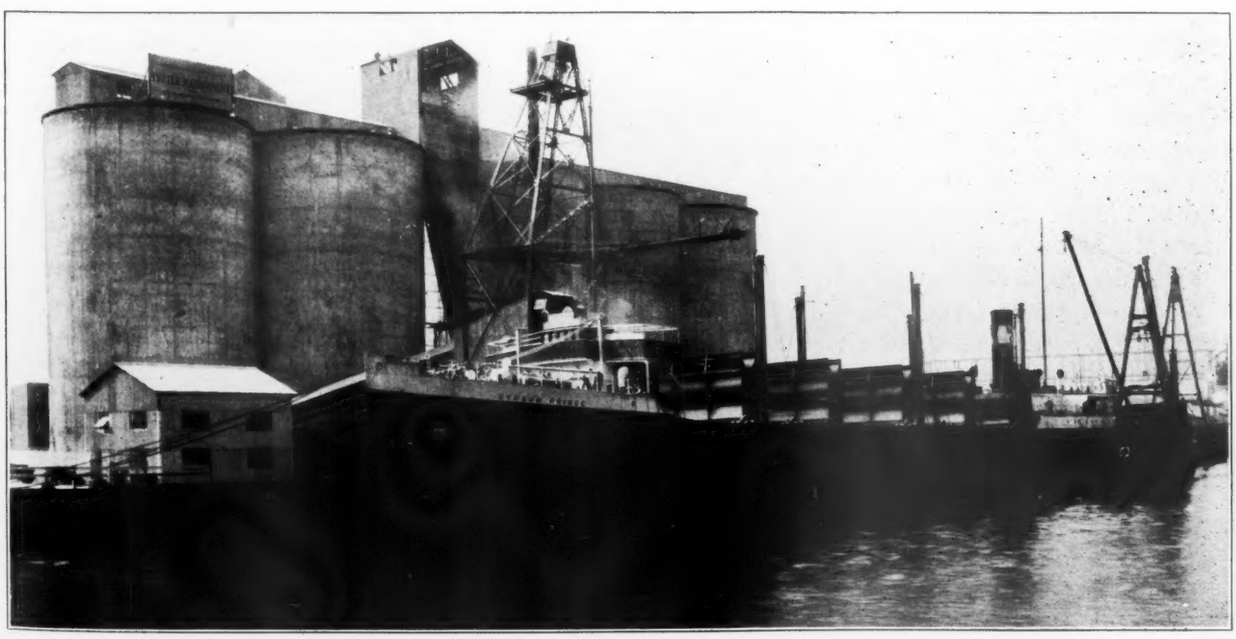
Elwell-Parker electric trucks are used to move the material from the packers to railroad cars or trucks for transportation.

In order to eliminate all free dust in the calcining mill and the warehouse, the company has installed an elaborate dust collecting and washing system. The collectors in the mill building are furnished by the By-Products Recoveries, Inc., and those in the warehouse, by the W. W. Sly Manufacturing Company.

The vents from the dust collectors, elevators and other pieces of equipment discharge into a washing system where all dust is removed. This system consists of a number of tunnels into which a large quantity of water is discharged through spray nozzles, causing a dense fog and collecting all dust too fine to be taken up by the dust collectors. The water for these sprays is furnished by three Ingersoll-Rand Cameron bronze pumps, each of 3,000-gallons-per-minute capacity, two of which pumps are operated continuously and the third held as a spare. The vacuum and draft for this system are supplied by two large Bailey exhaust fans, each of 17,000-cu. ft.-per-minute air capacity.

Of the United States Gypsum Company's own design, the board manufacturing equipment embodies a large number of improvements and refinements.

The stucco is drawn from the bottom of the be-



United States Gypsum Company's Steamship, Gypsum Prince, Delivering the First Load of Gypsum at Boston. The Unloading Equipment Handles a Load from Boat to Silos in 24 Hours

Board and Block Unit of Boston Plant

forementioned concrete silo by means of drag-chain conveyors. A screw conveyor, then a bucket elevator, and then a belt carry the stucco over a Merrick Weightometer. After being carefully weighed, the stucco is discharged into a stucco bin at the top of the plant.

A series of drag chains and screw conveyors transport the stucco to the mixing ends of the two board machines, which run parallel the full length of the building.

For the benefit of readers who are unacquainted with the general process of making plaster board, it might be explained that the process consists of placing plastic material between two layers of heavy paper, the paper used by the United States Gypsum Company being specially made in the company's own paper mills. The process is continuous, the bottom paper being first fed on the table from a revolving roll. On this the plastic material is automatically distributed, after which the top paper is fed on. As the sheet, or board, moves along the table, it is given form by rollers. At the end of the machine the board is cut to the required lengths and placed in the kiln to dry.

The finished board in this department is handled entirely by 5-ton Elwell-Parker trucks.

Those unacquainted with the advances made in the development of gypsum products in recent years will doubtless be surprised to learn that the plant just described manufactures well in excess of forty gypsum products, including both building materials and products for industrial use.

Among the building materials are wall plasters and finishes, mason's cement, moulding plasters, painter's plaster, Structolite (structural gypsum), Sheetrock, Gylap sheathing, Rocklath, and Pyrobar partition and roof tile. Among the industrial products might be mentioned pottery plaster, insulator plaster, corundum plaster, safe cabinet plaster, polishing plaster, terra cotta plaster, dental plaster, orthopedic plaster, and agricultural gypsum.

Safety Methods

(*Continued from Page 75*)

ploded dynamite and caps are mixed with the stone, subjecting the steam shovel crew and the crushing plant and employees to this danger. In other words, when making a blast, large or small, every precaution should be taken to make sure that every hole explodes.

Safe shelter should be sought for every blast. Men should stay under cover and allow ample time for small pieces to fall. The man who loads the shot should fire and no one else should be permitted to touch the firing switch or blasting machine.

Dynamite deteriorates with age and becomes less efficient and more dangerous. Where a new supply is placed in the magazine, that which remains on hand should be placed to one side and the oldest used first. The magazine should be kept clean and orderly—a wooden mallet and hard wood wedge should be kept in the magazine and used for opening boxes. No metal should be used for this purpose. A set of safety rules and rules for the storage of explosives, which may be procured from the Institute of Explosives, New York City, or any explosive manufacturer, should be posted on the inside of the door of each magazine.

Blasting caps and electric detonators should be stored in one magazine—separate from dynamite. All explosives should be stored in a dry, well ventilated building, a safe distance from plant, and other buildings, with all the protection it is possible to obtain. The plan of excavating in the side of a hill to set a magazine, with the hill forming most of the roof, is very poor storage; for the reason that such a set-up does not afford the proper ventilation. It is important that explosive magazines have proper ventilating, otherwise the material will take up moisture and will deteriorate much more readily. The DuPont Company, when erecting magazines, provides ventilation through the foundation under the floor, leaving about 2 inch open space in the floor all around the wall, with ventilators in roof or gables.

Road Builders to Meet

The annual meeting of the American Road Builders' Association will be held in Washington, May 2 and 3, 1929. On Thursday, May 2, there will be a reception by the president and the directors at the offices of the Association, National Press Building, Washington, D. C., from 3:00 to 6:00 p.m.

The regular annual meeting of the City Officials' Division will be held Friday morning, May 3rd, at 11:00 o'clock, at the offices of the Association. The reports of the Board of Directors and officers of the Division will be presented at this meeting.

Water Hauled Gypsum Utilized in Pacific Coast Plant

By GORDON F. SONDRAKER

FROM the San Marcos Island in the Gulf of Lower California comes the freshly quarried crude gypsum that is processed by the Standard Gypsum Company at its Long Beach, California plant.

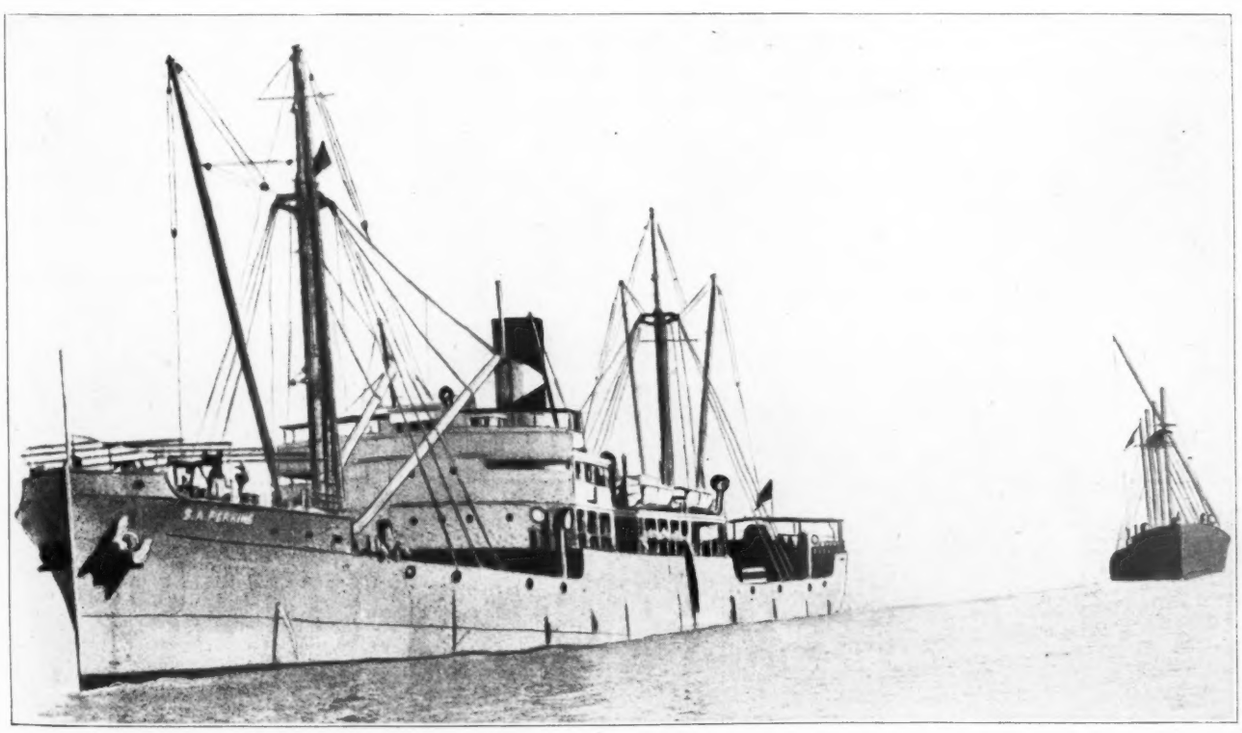
This material as quarried varies in size from four-inch lumps down to fines. It is loaded on board a steamer and barge (which are operating under contract to the company) by means of a long belt conveyor that handles the material practically from the quarry on the island to the boat which rests at the end of the pier.

The steamer *Samuel A. Perkins,* with a capacity of 8,000 tons of gypsum, and the barge *Daylight* with a capacity of 7,000 tons, make approximately two trips per month from the island to the plant at Long Beach harbor. An illustration shows the *S.S. Perkins* with the barge *Daylight* in tow entering the Long Beach harbor. The Standard Gypsum Company has a dock 350 feet in length at which the steamer and barge are docked in turn. A view of the dock and plant is also shown.

From the steamer the crude gypsum is unloaded by means of the ship's winches into a traveling hopper, manufactured by the Bodinson Manufacturing Company. This hopper travels on rails the full length of the dock and may be seen in the illustration of the dock and plant at the right-hand end of the dock. From the hopper the material is fed to a belt conveyor which is used also in connection with the traveling crane.

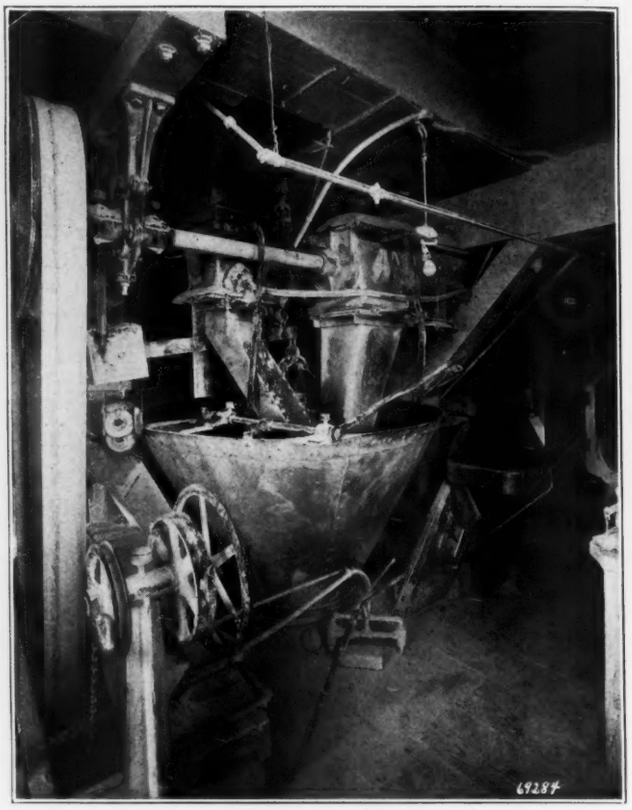
J. C. Hassel, Supt., at Right; Mr. Scott, Shipping Representative, in Center

The traveling crane pictured at the left end of the dock is used to unload the barge. This crane is equipped with a 1½-cubic yard Morrison clamshell which is electrically driven. The crane picks



Steamship "Perkins," Towing Barge "Daylight," Entering Long Beach Harbor With Gypsum

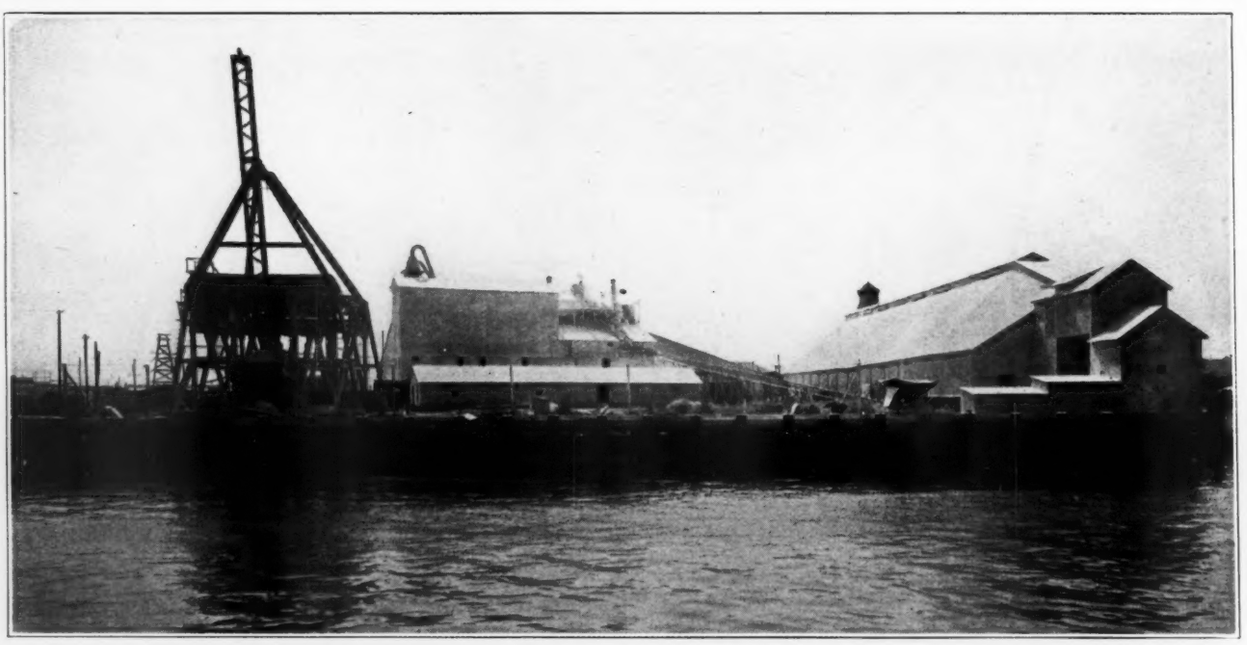
Hammer Mill



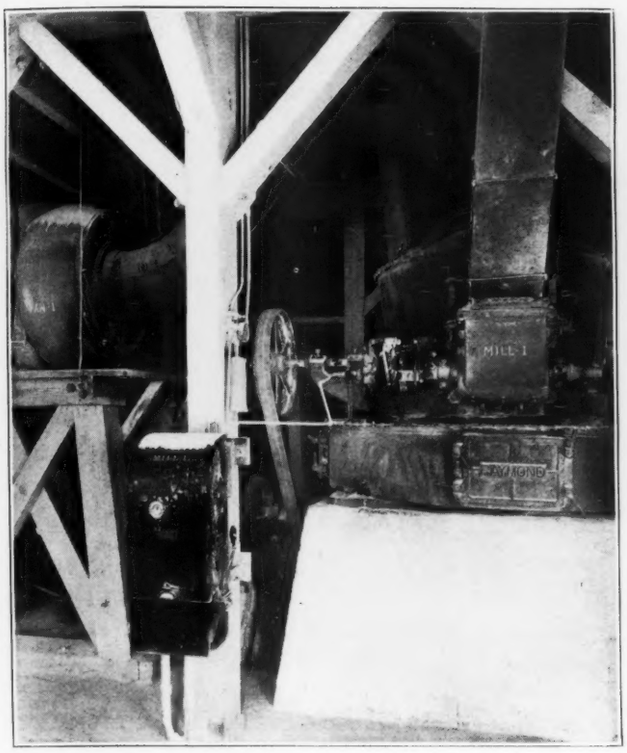
Ehrsam Weighing Hopper and Fiber Feeder for Plaster Manufacturing

up the material from the barge and deposits it in another Bodinson hopper which is built as an integral part of the traveling crane. This hopper feeds the material onto a thirty-inch conveyor belt 300 feet in length mentioned above in connection with the Bodinson traveling hopper. This conveyor delivers the material to a covered stockpile that has a capacity of 20,000 tons.

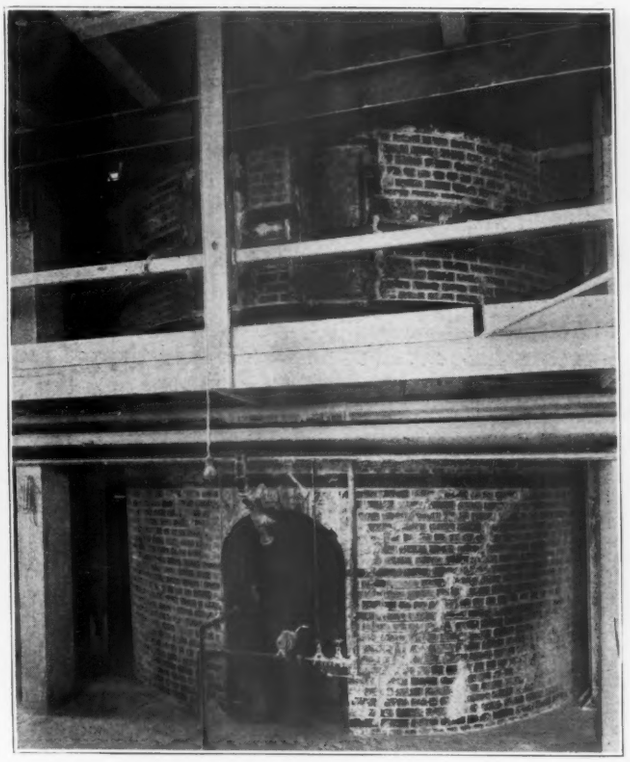
The crude gypsum is drawn from the stockpile by an 18-inch by 268-foot belt conveyor operating in a tunnel that runs under the stockpile. This conveyor delivers the material to a hammer mill No. S. X. 4, bearing the trade name of the Trojan mill and manufactured by the Pennsylvania Crusher Company. This mill gives a constant capacity of 50 tons per hour of crushed gypsum. The material is fed into the mill at four inches and finer and is reduced to ¾ inch and finer. The Pennsylvania hammer mill supplants a gyratory



Plant, Dock and Unloading Crane of Standard Gypsum Company at Long Beach, California



Raymond Mill



Firebox of Ehrsam Kettles

crusher which until recently performed the same operation. The ability of this hammer mill to successfully handle tramp iron that constantly finds its way into the crude gypsum as well as to crush the gypsum economically caused its installation.

From the hammer mill the material is fed to an 18-inch by 220-foot incline belt conveyor. This, in turn, feeds the crushed gypsum to a friction-drive Bodinson tripper which diverts the material into a 300-ton capacity wooden bin over two No. 5 Raymond mills. The material is fed by gravity into these two mills each of which is driven by a 40-h.p. direct-connected General Electric motor. These mills operate in conjunction with two Raymond air separators, the fans of which are each driven by a 50-h.p. direct-connected General Electric motor operating at 1,450 r.p.m. Each mill and its separator acting as a unit have a capacity of eight tons per hour of finished material that will average 90 per cent through a 200-mesh screen. One of the Raymond mills and a portion of the air separator are shown.

From the air separator the material is fed by gravity to a bin over the Ehrsam kettles, this bin having a capacity of 150 tons. The material is next delivered to the three Ehrsam kettles by a 12-inch by 12-foot screw conveyor.

Three 10-foot kettles, with a capacity of eleven tons to the charge, are in operation. These kettles and the rest of the specialized plaster manufacturing equipment used in this plant are manufactured by the J. B. Ehrsam and Sons Manufacturing Company. The crude gypsum is calcined in these kettles at a temperature of 350 degrees F., the temperature being regulated by means of Foxboro pyrometers. Natural gas from the nearby oil fields is used as fuel. However, the kettles are so equipped that fuel oil may be used on short notice in the event of any material price change in either fuel. The agitators in each kettle are driven by 25-h.p. General Electric motors.

A concrete hot pit measuring 10 feet by 12 feet is immediately under each of the three kettles and receives the calcined gypsum from its kettle by gravity flow. The material is taken from the hot pits by four 6-inch screw conveyors to each pit. These screw conveyors feed into a 12-inch by 30-foot cross screw conveyor which delivers the material to a bucket elevator having buckets 7 in. by 8 in. by 12 in. This elevates the material 67 feet and discharges it into a screw conveyor which apportions the material as desired to four bins. These bins are constructed of wood, are lined with steel, and have a total capacity of 500 tons.

A 12-inch screw conveyor takes the material from this bin to two Ehrsam automatic mixing and weighing hoppers. These hoppers automatically weigh the material in one-ton lots and then drop it into mixing bins underneath the hoppers. The fiber and retarder used are apportioned also in the mixing bin at this point. The fiber feeder may be seen to the right of the weighing hopper in the illustration.

The material is sacked direct from the mixing hopper by means of two 3-tube Bates packers and

is then delivered direct to trucks or to cars, sufficient trackage being at hand to hold five cars.

Agricultural gypsum or land plaster is also produced at this plant and, for this purpose, the material is fed from the Raymond air separators by gravity to a bin over a two-valve Bates packer and thence loaded on cars or trucks.

A small machine shop is operated at the plant. This shop contains a Davis lathe, a Sullivan 7-inch by 6-inch air compressor driven by a 15-h.p. motor, and a 7-inch by 5-inch Ingersoll-Rand air compressor that is used as an auxiliary in time of need.

The Standard Gypsum Company is officered by Martin Oldall, president; Samuel A. Perkins, vice-president; W. B. Gray, secretary; and Wallace C. Ridell, engineer in charge of production. The company operates plants in Gerlach, Nevada; Seattle, Washington; and Long Beach, California, the latter being the plant covered by this article.

The writer expresses his appreciation to F. T. McDonough, manager of the Southern California operations, J. C. Hassel, mill superintendent, and Frank Daily, mill foreman, for their highly valued cooperation in securing material for this article.

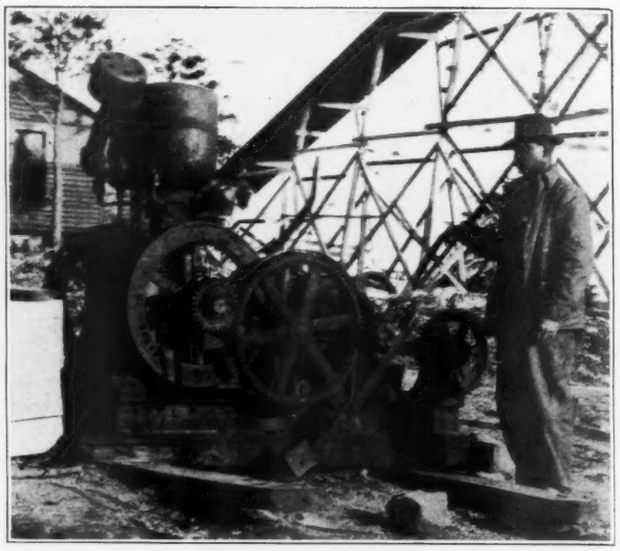
Foreign Cement Agreements

While there have been a number of agreements during the past year providing for the control of the cement situation in certain markets, there is yet no definite indication of the emergence of an international cement cartel comparable in scope and influence to metal cartels, according to Louis Domeratizky, chief of divisional information, Commerce Reports. Among the separate agreements may be mentioned the one between Belgium and Germany for the division of the Netherland market and the one between Belgium, France, and Luxemburg, limiting French sales in France. France is also to keep out of the Dutch market, leaving it to the Belgian and German producers. There is also alleged to be an informal agreement between the British and German producers providing for mutual exclusion from domestic markets, and an agreement between the British and Belgian interests for limitation of Belgian shipments to the British market in exchange for an obligation on the part of the British producers to keep out of the Dutch market.

Muscle Shoals White Lime

(*Continued from Page* 49)

The packed lime is loaded from the storehouse into cars on a siding from the Southern Railway's main line between Memphis and Birmingham. Shipments are made to all parts of Alabama and to Tennessee, Georgia, Mississippi, Florida, Louisiana, and South Carolina.



Novo Hoist That Hauls Cars Up Incline

Coal for kiln operations is obtained from the Alabama coal fields about 100 miles south of Cherokee.

The office of the Muscle Shoals White Lime Company is at Sheffield, Alabama. W. C. Roberts, president of the company, makes his headquarters there. Mr. Roberts is also treasurer of the Yourtee-Roberts Sand Company which operates a sand and gravel plant at Chester, Illinois, and a stone plant, the Charles Stone Company, at Cypress, Illinois. The lime company is also a subsidiary. Emil B. Yourtee is vice-president of the parent company, J. H. Warner is secretary and L. B. Yourtee is assistant treasurer. J. B. LeCroy is superintendent.

Manufacturers' Division of N. S. & G. A. Nominates Officers

In accordance with action taken at a meeting of the Manufacturers' Division immediately following the recent convention of the National Sand and Gravel Association in Cleveland, Ohio, a nominating committee was appointed to recommend officers for the division to serve through the balance of the current year and until the 1930 convention of the Association.

The nominating committee held a meeting in Atlantic City and recommended as follows: Chairman: H. M. Davison, Harnischfeger Sales Corporation, Milwaukee, Wisconsin; Executive Committee: M. B. Garber, Thew Shovel Company, Lorain, Ohio; Bruce Shotton, Hendrick Manufacturing Company, Carbondale, Pennsylvania; C. G. Lewis, Bucyrus-Erie Company, Milwaukee, Wisconsin; L. W. Shugg, General Electric Company, Schenectady, New York; N. C. Rockwood, Rock Products, Chicago, Illinois; D. D. Guilfoil, Sauerman Brothers, Chicago, Illinois.

The Economics of Plant Location

BY C. H. SONNTAG

THE design and construction of plants for manufacturing cement and for preparing the other common non-metallics for market often involve the highest degree of technical knowledge and building technique, and not infrequently call for the solution of engineering problems of the first magnitude. Some of these plants seem to approach closely to mechanical perfection, and their owners, designers and operators are justly proud of them. And yet, notwithstanding this, it is no more than a truism to say that if the product of such a plant can not return a profit to its owner when fairly meeting the competition in its field, it is a business absurdity, and was probably built without thorough and painstaking consideration of the fundamentals on which every successful manufacturing business must rest.

The broad field of building construction, in which we must include roads and improved highways, uses a wide variety of materials. Most of these are relatively high priced per pound, so that transportation is not a vital part of their delivered cost. They are rather in a class apart, so that in this discussion they will not be further considered, and we will concern ourselves with the heavy, bulky, low-priced commodities, cement, crushed stone including fluxing stone, gravel and sand.

The erection of plants for preparing these has not ended. Every new issue of the trade papers carries notices of the projection or beginning of construction of new ones. Some are adequately financed, and their propositions are based on a careful analysis of all the factors involved. Others are entering the arena without sufficient financial provision for the lean years, which are apt to be first ones, and their works are so located with reference to markets that they will always be at a disadvantage as compared with their more fortunately situated competitors. Such concerns will drag along for a while, disorganizing the market as long as they exist, but they will finally succumb, following the inexorable law of the survival of the fittest.

In what follows, an attempt has been made at a systematic presentation of the factors involved when a new enterprise in this field is under consideration. Some of them, perhaps, fall in the class of intangibles, but most of them, if they can not be put on a cash basis, can be sufficiently evaluated to give a pro or con reaction in the mind of the man who must supply the money. Some of them can be expressed in dollars and cents within reasonably close limits, while others can be ascertained quite definitely.

The products that we are about to consider have already been mentioned. Further discussion will be under the headings:

I—Market
II—Raw Materials
III—Transportation
IV—Fuel
V—Water Supply
VI—Power
VII—Labor

I—Market

It would seem that the first question that those proposing to establish a new industry would consider would be the prospect of the product being absorbed in the territory that could properly be considered its selling field, and yet it does seem that many of the new entrants, especially the smaller ones entering the aggregate field, give this phase of their business very little thought, but rather start up blindly. Producers already established in the same field are not going to "silently fold their tents" because the newcomer has started his plant. They have their sales forces organized, their customers lined up, and are well known to the trade. If consumption in the territory is not increasing, the appeals of lower price or better quality are the only ones that the latest comer can make to the dealer and consumer. If he cuts the established price he not only jeopardizes his own profit, since the operation of a new plant is apt to be unusually expensive the first year, but he upsets the whole market. The older concerns will probably meet the lower prices, for a while at least, and the result is general lowering of the price level at the expense of all the producers. On the other hand, if the newcomer supplies the field with a better article than that previously available, such as harder crushed stone, flux stone of higher lime content, cleaner or better graded sand and gravel, or cement of high strength, he is justified in selling at the established market, or even asking an advance over it if the merits of his product warrant so doing.

Editorial Note

Readers of the accompanying discussion of the salient factors that should be weighed wisely by the promoters of every proposed non-metallic plant will conclude, rightfully, that the author knows whereof he writes.

Mr. Sonntag is, indeed, an authority in matters relating to the design, erection, and operation of large, successful plants. Further, he has specialized in studies of the many vital economic phases that are unrecognized ordinarily or that are not deemed sufficiently essential by most engineers.

PIT AND QUARRY is pleased to present herewith the first installment of this forceful thesis. The second installment will appear in the issue of April 24. We are privileged to announce, for publication in early succeeding issues, another valuable and intimately related paper by Mr. Sonntag, dealing with the economics of plant design.

If a given territory is served only by producers at some distance from it, so that they are working outside their proper sphere, and the customer is paying a heavy freight charge on shipments from these distant producers, then a new concern establishing a plant near the center of this sale territory has a legitimate field and an excellent chance of success. But if the territory is already adequately served by older producers as advantageously situated as the new one as to plant costs and freights, and there is no prospect of increased consumption, the case is different. Then it is well to remember that if people do not have a real need for a thing, they are not apt to buy it at any price.

There were until recently certain sections of the country that were not adequately served in the matter of portland cement, although each consumed a large tonnage annually. The nearest mills were at considerable distances, and freight charges were high. The cost of every structure built of concrete was in consequence enhanced by this heavy freight charge. The building of mills in such regions was on a sound economic basis.

Plastic magnesian lime is shipped today to all parts of the country from a small section in northwestern Ohio because it is preferred for certain uses over local limes. It seems as though it should be possible to make just as good lime in other locations. A thorough investigation of this might be expensive, but if successful the cost would be returned many fold, for freight is now a large part of the delivered cost of this lime.

Customers are apt to have very pronounced ideas as to how, when and where they want to receive their building supplies. The concern that goes the farthest in meeting any rational wish of the customer along these lines will, other things being equal, get the business.

In considering a particular market, it should be ascertained whether it is to be permanent or temporary, and if the former, whether it is expanding or falling off in volume of business.

A permanent market is usually the result of the many diversified, though perhaps individually small, requirements of the building trades. It has been shown that, in general, the volume of new building increases at the rate of about 3½ per cent a year, but this might not and probably would not be true of any one district. It is well known that, in cities, real estate booms and building activity progress in waves or cycles of about thirty years. The crest of the wave is characterized by extreme activity and good prices, the trough by near stagnation and sales at or near cost. The vital point is not so much the general percentage of annual increase, but the total volume of sales being made in the prospective sales territory, and the proportion of this that a new enterprise may hope to get.

A temporary market is usually dependent on some one particular construction project. It may be a new highway, or perhaps a group of roads radiating from a common center. It may be the ballasting of a long stretch of railroad, for railroads are coming more and more to the use of high-grade ballast. In such cases, the total tonnage to be sold can usually be ascertained within quite close limits, and the total profit estimated. The plant supplying a temporary market has nothing but salvage value after the market has been supplied. It follows that, in figuring the cost of production, the loss in value of the plant should be spread over the total tonnage so as to be considered a part of the cost of production. Plants built to supply a temporary market should be lighter and of cheaper and less permanent construction than those that are expected to run for a number of years. Those sometimes set up by highway contractors so that they may get out their own stone, sand and gravel, fall into this class.

It may seem elementary to suggest that it be definitely ascertained that there is enough material available to supply a temporary set-up with all it will need; but as many gravel bars in creek beds are of limited extent, this point will sometimes bear careful investigation.

II—Raw Material

We are concerned with quite a variety of these, depending on the industry to be established and the location proposed for it. They may be shown best in tabular form.

Products	Raw Materials
Cement	Limestone, cement rock, marl, shells, shale, clay
Crushed stone	Limestone, trap and granite
Flux stone	Limestone
Sand and gravel	Natural deposits of these

Cement

A cement mill is not built for short-term operation. The heavy investment precludes this and, so far as the writer knows, all, with the exception of some using marl, have enough raw materials to last many years, certainly beyond the life span of those now active, and possibly beyond the life of the cement industry. It follows that the promoters of a new cement plant must be unqualifiedly certain that the supply of all the raw materials is ample.

Limestone

A cement mill making one million barrels a year for fifty years will use about 12,500,000 tons of reasonably pure limestone. Many mills are of larger capacity than this, and we do not know that cement or some equivalent lime product will not be made fifty years from now. These figures are given as a rough indication of the tonnage of stone that should be in sight.

If the rock crops out in a high face, and the strata are horizontal or nearly so, an approxima-

tion of the amount that can be gotten out may be made by surface measurements, having due regard to excessive stripping that would make recovery too costly or necessitate mining.

If the rock is in highly inclined strata and not covered by stripping, or can be easily uncovered, the amount of stone in place can be roughly calculated. The tonnage recoverable will depend on local conditions, such as the possibility of open-cut working or the necessity of mining, and the percentage that must be left as pillars.

When the strata are highly inclined it is important to note that compressed folds may occur in the region being studied, so that the same rock layer may come to the surface more than once. These outcroppings may be separated by worthless stone whose presence must be considered in any scheme of recovery. Rock folding commonly takes the form of the letters U or V, either in normal position or inverted, or both. In the normal position the trough of the fold may and probably will go below the depth of profitable recovery. There are other types of folds and rock deformations and displacements, and, where the property involves these, the judgment of a trained geologist will often be worth far more than its cost.

If the strata are entirely below ground, covered with heavy stripping so that they can not be seen, it will be very difficult to get much of an idea of the formation without drilling. In this sort of investigation, core drilling, while more expensive, is preferable to churn drilling. The core drill brings up a solid cylinder of stone that may be studied both physically and chemically, and a part of the core can be saved for future study or reference. The churn drill, on the other hand, brings its sample up as mud and small chips, from which it is not always easy to judge the true physical condition of the stone, and there is always danger of the sample being salted or altered in composition by wash from the surface, from the point where the casing through the stripping rests on the rock surface, or from soft strata in the rock itself. It must be admitted, though, that the core drill does not take a good sample of such materials as soft shale nor, of course, of unconsolidated clay or other substances. When a limestone deposit consists of many layers interstratified with many strata of shale, the latter are not well represented in the sample taken by the core drill, and may be practically missing.

Sometimes the property under consideration will be found to lie in one of the quadrangles that have been intensively studied by either the United States Geological Survey or the geological survey of the state in which it lies. The published reports of these departments will be found invaluable when they can be used.

In speaking of limestone for cement making, any stone containing more than 78 per cent of calcium carbonate, and low in magnesia, may be used, but it need not be a very pure stone. But the purer it is, the more clay or shale will be needed to mix with it, and where these are to be expensive, either in recovery or freight, the bearing of the composition of the stone on the cost of clay or shale should be considered.

When the limestone is to be mixed with blast-furnace slag, a much larger percentage will be required as the stone becomes more impure and, in this particular instance, a relatively pure stone is very desirable.

When even a quite pure limestone is interstratified with shale or clay, there may be too much of the latter to permit the entire output of the quarry to be used in cement making. It would be necessary to get rid of some of the shale or clay by some process of washing or differential screening. This is not always easy to do and, besides, there is the problem of disposal of the rejected material. This state of affairs has prevented the establishment of cement plants at raw-material deposits that otherwise are suitable.

Cement Rock

Much of what has been said under the previous heading applies to cement rock also. There are relatively few commercial occurrences of cement rock in highly inclined strata. The developed deposits are mostly nearly horizontal, but it is not unusual for the composition to vary more in the same layer than is the case with limestone.

There are a few deposits of cement rock that in the past have been considered to be of the correct composition for cement making without the addition of any other material, but the present tendency toward higher limed cements is making it difficult to continue operations on this basis. Most cement rock is too low in lime, and some other form of the latter, usually purer limestone, must be added to it. If this pure stone must be purchased and shipped in, as is not uncommon, its cost becomes an important part of the cost of manufacture, and it becomes increasingly so as the percentage of lime in the cement rock falls below that required in the completed raw mix. Hence, in considering a deposit of cement rock, the source and cost of the limestone that must be mixed with it must be given careful thought.

The available tonnage and the analysis of a deposit of cement rock may be ascertained by means of the core drill, as in the case of limestone.

Marl

This was at one time an important source of raw material for cement making. Its relative standing has greatly decreased in recent years, since the known deposits are practically all in New York, northern Ohio and Indiana, and southern Michigan.

A number of the beds that were once exploited have been exhausted and, as the territory in which marl is found is already adequately served by existing mills, the building of a new mill in this region based on the use of marl does not seem justifiable. All marl deposits are limited, and their extent can be definitely determined by proper testing. Of course, if a large enough quantity of marl could be found near a market and distant from other sources of lime, its exploitation might be worth while. At present, no such deposit is known.

Shells

These are used by a few mills in Texas and California as a source of lime. Such developments are purely local propositions, each of which called for individual investigation, so that they hardly find a place in a general discussion of raw materials.

Shale

Many mills use shale as the source of silica and alumina for cement making, mixing it with the required amount of lime. Much that has been said of limestone and cement rock applies with equal force to shale, but as it seldom forms over 20 per cent of a cement mix, its cost delivered at the plant is not as important as that of limestone. It is essential that its chemical composition be correct, especially as to the ratio of silica to alumina. The study of the chemistry of cement raw materials is a specialty in itself, and is outside the limits of this article.

Soft shale can be dug by power shovels without blasting, but the harder ones will need to be loosened by light charges of powder. Shale is easily altered by weathering and, while it may be soft at the surface exposure or may be changed to ordinary clay, it may become very hard with depth, which possibility should be borne in mind when selecting equipment to recover and handle it.

Certain shales in Kansas and Oklahoma contain occasional crystals of pyrite, galena, and sphalerite, these being the sulphides of iron, lead, and zinc respectively. They give no trouble in the process of making cement, as the sulphur, lead, and zinc are volatile at kiln temperatures, while the iron oxidizes and acts like the other iron oxide in the shale.

The color of the resulting cement is largely dependent on the percentage of iron oxide in the shale or clay. This can be determined only by analysis, as a red shale or clay may contain less iron than a blue one.

As with stone, it is essential to know the tonnage of shale available, and to know that all this tonnage is of correct composition. This is usually best done by drilling but, as stated before, the core drill will not give good cores in soft shale. In the harder varieties it may do quite well, but if it can not be used, the churn drill must be depended upon.

Clay

The northern part of the United States was, as is well known, once covered by a thick, moving ice sheet. When it retreated, this ice left immense deposits of sand and gravel in some places and, in others, a fine-grained clay. Most of this clay is of the correct composition for cement making, and quite a number of mills are using it. Similar clay is found in the alluvial bottoms bordering the Mississippi and other large rivers.

The glacial clays are, as a rule, quite constant in physical properties and composition in any one bed, though they vary more than the hard rocks. There is danger, owing to the way in which these beds were formed, that streaks, bars, or lenses of sand may occur in the clay, and only systematic sampling will find these. This sampling may be done with a post-hole auger or a smaller earth auger, and should be carried on in some regular manner so as to develop the size and constancy of composition of the deposit. If the clay contains occasional small pieces of gravel but is otherwise suitable, it may be used, as the gravel can be separated mechanically.

Clay beds, formed in the flood plains of rivers, are notoriously variable in make-up, as sand bars and lenses occur irregularly through them. Exceptionally careful sampling and analysis are required to give assurance that the clay is sufficient in volume and correct in composition, and that it can be recovered without mixing with sand.

All shale beds that outcrop at the surface, and that are not frequently washed by streams or heavy rains, are weathered to clay. This clay may be quite deep if it has been undisturbed for ages, but it will gradually alter to the original shale with depth, and only a knowledge of the geology of the region will tell whether this is to be expected. The depth of the soft clay will, of course, be learned by drilling; but, in equipping a plant to handle material from such a deposit, machinery should be selected that will handle both clay and shale, unless there is enough clay to warrant using it only for some years.

There will be but little difference in chemical composition between the clay and shale, except for the additional water held by the former.

(To be continued Next Issue)

Gypsum Trade Adopts Rules

A list of twenty-one rules for trade practice in the gypsum industry was turned over to the Federal Trade Commission at the close of a two-day trade practice conference held recently at the Waldorf-Astoria Hotel. The list was divided into two sections, the first listing practices which were regarded as illegal and the second those activities which, although not contrary to law, were regarded as uneconomic.

Victor Plaster Completes Plant for Mining, Crushing and Loading Gypsum

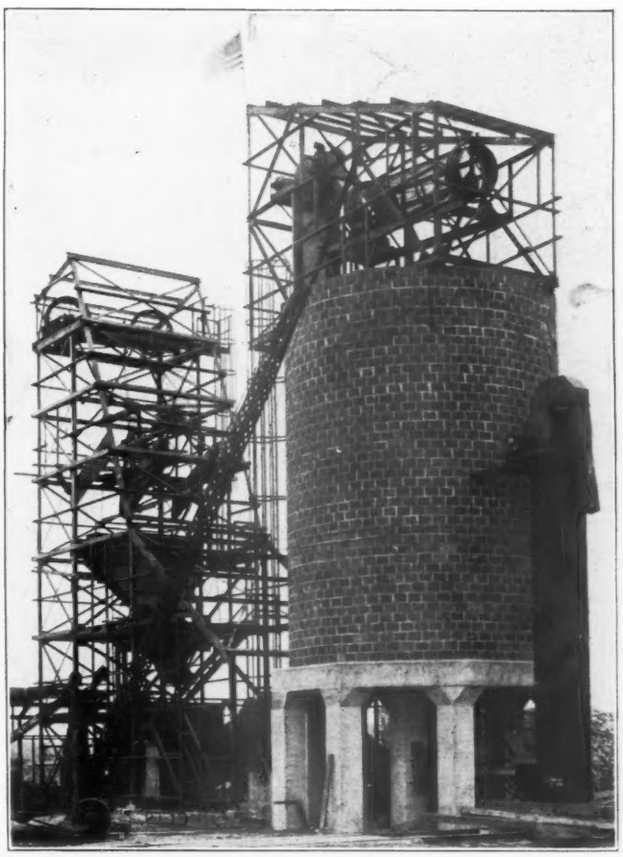
ONE of the most modern plants for mining and manufacturing gypsum rock has recently been started in production by Victor Plaster, Incorporated of Victor, New York. The management of the design and construction of the plant was under the supervision of S. Firestone, consulting engineer, while the fabrication and erection was done by C. O. Bartlett and Snow. Dr. C. A. Huber is president of the company and Charles Spengler is superintendent of the property.

The mine shaft is about 110 feet deep and two self-dumping cages are provided for hoisting 2-ton loaded cars to the surface and lowering empties into the mine for reloading. The cages are hoisted by a Bartlett-Snow standard hoisting engine with a 48-inch diameter drum. The drum is equipped with Monitor plow steel cables 1 inch in diameter which are carried over steel spoke sheaves 60 inches in diameter.

The engine is made up with a cast iron base on which is mounted an oil housing so that the gears operate in an oil bath. In addition to the oil housing, the cast iron base carries the 50-hp. motor which operates at 900 rpm. and the outboard bearing for the drum shaft. The herringbone gears are cut from steel castings and the pinions are cut from steel forgings. The shafts are made of hammered finished steel, on which the high speed and intermediate operate in Timken roller bearings and the low-speed in bronze bushed bearings. The motor is connected to the high speed shaft with a flexible coupling.

A Cutler Hammer semi-automatic control, complete with a traveling cam limit switch mounted on the engine and geared direct to the intermediate engine shaft by means of cut steel bevel gears is provided to control the operation of the cages. A push button station is also provided at the mine shaft so that the cages can be stopped at the ground level for loading and unloading mining equipment. A brake is provided to hold the cages in any position should the power fail, and for safety features, slack cable and overtravel switches are provided.

At the top of the tipple frame, which is constructed of steel, the rock is dumped into a weighing hopper. After weighing, it is discharged through a loading hopper, equipped with a regulating gate, onto a 36-inch apron conveyor which feeds the rock to a jaw crusher where it is crushed to 1½-inch size.

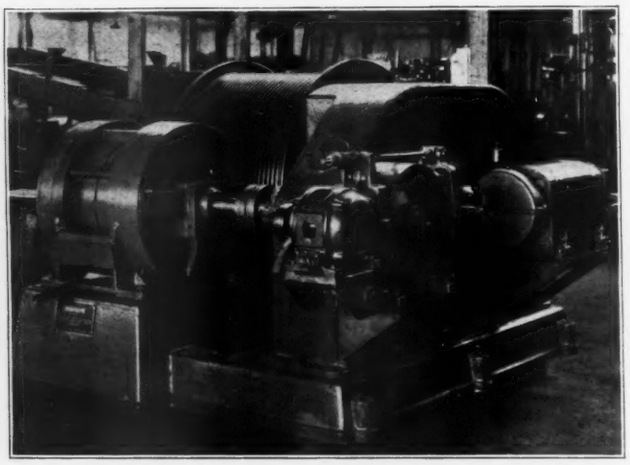


View of Plant Before Siding Was Attached

The apron conveyor which feeds the crusher is made up of double beded bottom plates carried on two strands of 12-inch pitch chain constructed with high carbon steel drop forged links and 1¼-inch diameter steel shafts extending under the pans from one strand of chain to the other. On each end of each shaft there is provided a cast iron single flange chilled tread dust tight roller cast with the outer end solid and the end where the shaft enters is equipped with leather and steel washers. Overlapping pressed steel sides are riveted and welded to the bottom plates. Lubrication of the rollers is by means of Alemite high pressure fittings.

An elevator with 14 by 7-inch malleable iron buckets lifts the crushed rock from the crusher to a 48-inch diameter revolving screen mounted in a structural steel house over a silo 22 feet in diameter by 30 feet high which is set on a concrete base so that the bottom of the silo is about 10 feet above the ground.

The screened rock drops into the silo and the



Main Hoist for Gypsum Mine

oversize is returned to the crusher by means of a belt conveyor and steel chutes. When the crushed rock is shipped it is discharged from the bottom of the silo onto a 30-inch Schaffer poidometer which weighs the rock and delivers it to an elevator equipped with a flexible spout for loading into box cars.

The entire operation, from the time the mine cars are placed on the cages at the bottom of the mine shaft, until the crushed material is delivered into the cars for shipping, is automatic so that the operating costs are very low. The materials used to make up the different units of the plant are exceptionally heavy so that the chances of delay and loss from a breakdown are minimized.

Producing Light-Weight Aggregates for Making Concrete Is Interesting New Industry

Methods for the production of light-weight aggregates for concrete have been the subject of numerous patents for more than 60 years. However, it is only recently that the industrial importance of such materials has been fully appreciated. Low-grade clays, shales, and shale rock when heated at about 2,000° F. for a short period of time, expand from 2½ to 3 times their original volume. Materials sinterred in this manner, when subsequently crushed and used as aggregates, yield concrete of the same or somewhat higher compressive strength, and of only two-thirds the weight of concrete made with ordinary rock and sand aggregates. The lessened dead weight resulting from the use of these materials effects a considerable saving in the cost of structural steel for large buildings, bridges and other projects.

The importance of this new industry is evidenced by the number of inquiries concerning the deposits of clays and shale available for manufacturing of light-weight concrete aggregates. In view of this, the Non-Metallic Minerals Experiment Station of the United States Bureau of Mines, in cooperation with the Ceramics department of Rutgers University of New Brunswick, N. J., is planning a survey of such deposits, and a laboratory investigation of the fundamental factors involved in the manufacture of these aggregates.

The Setting of Plaster Paris

Calcined gypsum for certain purposes, such as for use in construction, must have a fairly quick set. However, sufficient time must be allowed to permit thorough mixing of the material before pouring into the forms. It has been generally accepted that the plaster is useless if the set has started before it is in place. Preceding the set, a stiffening of the calcined gypsum putty occurs, and tests have been made to determine for what period the putty can be worked without materially reducing the strength of the set gypsum.

A large batch of calcined gypsum (plaster paris) was mixed with sufficient water to bring it to standard consistency, and 3-in. by 6-in. cylinders were cast two minutes after mixing, and at one-minute intervals thereafter until the paste was too stiff to be forced into the mould, even by using considerable pressure. A typical set of results follows:

Time after adding water.	Compressive strength lb. per sq. in.
2 minutes	1,070
3 minutes	1,060
4 minutes	1,100
5 minutes	1,070
6 minutes	910
7 minutes	710

The material for the specimens at six and seven minutes had to be pressed into the mould. Similar results have been obtained using retarded mixes, with longer time intervals between the casting of the specimens, and using mixes containing various proportions of wood chips.

Illinois Silica Sand Traffic Association Secures Reduced Freight Rates

The Interstate Commerce Commission has just rendered a final decision with respect to the rates on silica sand from the Ottawa, Illinois district to points in Illinois, Indiana, Michigan and Wisconsin, effecting a general revision of existing rates. A mileage scale has been prescribed which effects reductions in the existing rates. The new rates are to be published not later than May 16th.

Air-Drying During Pulverizing Boosts Production In a Gypsum Plant

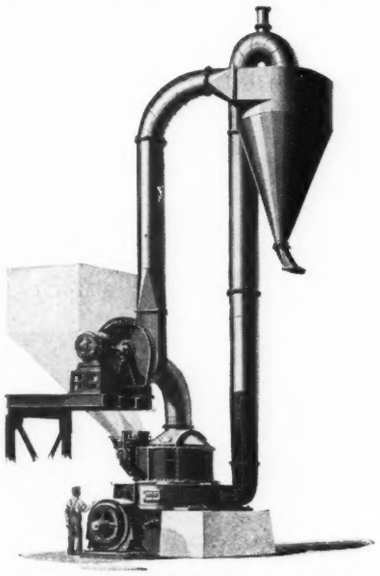
THE value of air-drying in the mill, as applied to gypsum manufacture, was decisively demonstrated by a carefully checked test, recently made at the plant of a large plaster concern in New Jersey. The results obtained are of particular significance to the rock products industry, because they prove the practicability of drying materials during the pulverizing process.

For years, this plaster company has been grinding Nova Scotia rock just as it came to the plant without any preliminary drying. The Raymond system of air-drying was installed to determine what effect it would have on production. Since the Kiln-Mill is a standard Raymond roller mill, specially equipped with air-drying apparatus, it was an easy matter to change over the existing installation of a Raymond No. 5 low-side roller mill into a complete Kiln-Mill unit.

The accompanying illustration shows a typical unit of this sort. A similar scheme was followed in making the test in this gypsum plant. The installation included air-separating equipment, consisting of a vacuum air separator, exhauster, cyclone collector and welded-seam, dust-tight steel piping. The air-drying system comprised a direct-fired oil heater with fan and compressor, all under thermostatic control. Special measuring instruments were employed to determine the amount of oil burned per hour, the volume and velocity of the hot air used, the amount of vented air and the amount of moisture removed. The output of the mill was taken at 7.5 tons per hour, based on the average month-to-month capacity of the plant.

Prior to the test, it had been the custom to grind the gypsum without any pre-drying operation, consequently the powdered material was delivered to the bins carrying some moisture in a cold condition. The bins over the kettles were of steel on three sides, while a brick wall formed the fourth side. When the gypsum was permitted to settle for 24 hours or more, it had a tendency to pack in the bins. In order to get it to flow into the kettles below, air hammers had to be used to loosen it from the steel sides. This would only partly empty the bins, however, for the powdered gypsum would stick to the brick wall from top to bottom. Sometimes, the mass would be four or five feet thick, arching over the conveyor nearest the wall and rendering that useless. Frequently, the mass had to be poked loose with long rods from above the bin.

It was in overcoming these difficulties that the drying process proved highly effective. The ground gypsum now enters the bins at a much higher temperature and in a thoroughly dry condition. The hot-air duct, leading to the grinding chamber, registers 455 degrees F. As the



Raymond Kiln-Mill for Pulverizing and Drying Materials in One Simultaneous Operation

hot gasses mix with the air used for separation, the temperature drops to a moderate degree. In the air separator, the reading is 20 degrees F.; at the fan discharge, it is 195 degrees; and in the return air pipe, 183 degrees.

The powdered gypsum is delivered to the bins at a temperature of 180 degrees F., instead of 43 degrees, at which it enters the mill. As a result, there is absolutely no trouble encountered in arching or packing. The bins clean themselves clear back to the wall, no air hammers are needed, and both screw conveyors in the bins are always open and ready for use.

With the gypsum cold and damp, as formerly, it came out of the bins in large lumps. Consequently, the kettles could not be filled, as the lumpy material would impose too much of a strain on the agitators. Usually the filling had to be done at two or three intervals, thus considerably slowing up the operation. Now, with hot and dry gypsum as produced by the new process, the material is free flowing and the kettles are filled to capacity at once. The time in the kettles has actually been reduced from three hours to two hours. What the Kiln-Mill has accomplished in this case, therefore, is a production increase of 33 1/3 per cent in the kettle room. In addition, serious bin difficulties have been overcome, making an important saving in labor and time. Moreover, the heat absorbed by the gypsum in the air-drying process is not entirely dissipated, for it carries through to the kettles, where less heat is now required for calcining. There is an obvious economy in fuel for calcining, and an appreciable increase in the mill itself, incidental to the drying action. Further determinations are being made to find just what these savings are.

Testing Plaster of Paris For Quality

Certain simple tests are very convenient for determining the quality of plaster of Paris. Put a litle plaster in a third of a glass of water and pour out the excess so that a few drops of thin plaster flow out also and the plaster has acquired its maximum content of water. Stir gently and slowly with a glass rod and invert over a clean glass plate. On removing the glass, plaster from a rotary kiln is level, while from a kettle it will stand higher in the middle. The remainder of plaster in the glass should be divided between the sides and bottom and let stand. After it has set, rinse with water and the whole may be readily removed, if the quality is good. The walls may be only 0.1 mm. thick but strong and elastic. If poor, the walls and bottom crack. After the temperature of the test piece has just reached that of the room, pieces broken from the side should not chalk on rubbing between the fingers. An improperly burned plaster does not take up the water smoothly and evenly, requiring much working. For dental plaster a burning temperature of 15 to 25 degrees higher is required than for ceramic plaster. Some of the plaster burned in a shaft kiln has a slow pouring rate and is suitable for making forms. Plaster burned slowly at a temperature constant to 3 is often desired. Wilhelm Schaper (Tonind. Ztg. *52*, 1923-4 (1928). C. A.

Praise Stone Firms For Light Blasting

Local stone companies are conducting blasting operations in a manner which has met approval of the La Grange, Illinois, police department. Under an arrangement in effect since last summer, quarry officials notified the local station in advance of each blasting and then inquired whether the blasting was severe.

A daily record is kept of each explosion. Officers state that in most instances the blasting was not noticeable at the station.

The Uses for Fuller's Earth

This natural earth is used largely in filtering oils but it also is the base for the manufacture of beauty clays, soaps and other widely-used cosmetics. Its name comes from its early use in the fulling of cloth.

Bates Valve Bag Sold

Acquisition of the business of Bates Valve Bag corporation by St. Regis Paper Company was recently announced. This brings into the St. Regis group a concern with assets totalling nearly $10,000,000, the Bates corporation being the largest single factor in the manufacture of paper valve bags. Plants of the corporation and its subsidiaries are at Los Angeles, California; Birmingham, Alabama; Toledo, Ohio; Nazareth and Oakmont, Pennsylvania; Covington, Virginia; Menominee, Michigan; Dryden, Ontario; and Three Rivers, Quebec.

Group Life Insurance Covers Company's Employes

Group life insurance protection has recently been acquired by the Pine Mountain Granite Company, of Atlanta, Georgia, for its 81 employees. The total amount of the policy involved is $43,500. It is of the noncontributory type, the insurance being issued to the employees without any cost to them, and each employee is insured in amounts ranging from $500 to $1,500, according to the rank or position held.

Rise in Temperature Not Indicative of Waste in Ball Milling

Heat that is generated in ball milling is the actual result of work done within the mill and is not an indication that energy which should be expended in crushing is being dissipated as heat. The Mississippi Valley experiment station of the U. S. Bureau of Mines formed this conclusion after much study of milling. A heat study was made of a commercial ball mill where the surrounding temperature was about that of the feed and discharge, so that there was little radiation. The specific heats of the ore and of the water were taken into account, and the mechanical equivalent of the heat was fornd to be about 125 hp. The motor input was 235 hp. These figures, it is believed, give a measure of the relative amount of energy expended within the shell of the mill for crushing purposes. Dead load tests are now being made to check this.

Diatomaceous Silica Studies As Admixture in Concrete

A study of the representative diatomaceous silicas produced in the United States for use as admixtures in concrete is now being made at Washington by the Bureau of Standards for the purpose of developing federal specifications for this material. Samples have been obtained from producers. The petrographic analysis, fineness through the No. 200 sieve and the weight per cubic foot have been determined. The material runs from a minimum of about 70 per cent diatomaceous silica mixed with quartz and clay, to almost pure diatomaceous silica. All samples are finely divided from 86.2 to 99.5 per cent passing a No. 200 sieve. Determining the weight per cubic foot introduced difficulties, the weight of any one material varying according to the method whereby it was placed in the measure. However, after careful experimenting, it was found that the variation in weight per cubic foot was from 7.5 to 34.7 lb. Only one specimen weighed more than 16.2 lb. per cubic foot, six of the specimens varying from 14.3 to 16.2 lb. per cubic foot.

Lime Plant in Operation 45 Years

At Erin, Tennessee we find one of the oldest lime plants in the southern part of the United States. John Conroy of Clarksville, Tennessee, established it in 1871. The original plant consisted of one primitive set and draw kiln. One week was required to set the burner and draw this kiln of 60 barrels capacity. The rock to fill the kiln was hauled in ox cars.

Two years later a second kiln was built, increasing the weekly output to 120 barrels. About 1885 the first patent kiln was started operating and the old kilns abandoned. Later other kilns were built, and a mill located at the plant, furnishing the cooperage material for manufacturing the barrels used for shipping lime. Although plant has been operated by different firms, it has run practically all the time since it was established.

Ownership of PIT AND QUARRY

Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of PIT AND QUARRY, published bi-weekly at 538 S. Clark Street, Chicago, Ill., for April 1, 1929. State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared V. E. Larsen, who, having been duly sworn according to law, deposes and says that he is the business manager of PIT AND QUARRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse side of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Complete Service Publishing Co.; Editor, A. J. Hoskin; Managing Editor, A. J. Hoskin; Business Manager, V. E. Larsen.

2. That the owners of 1% or more of the total amount of stock are: H. W. Baumgartner, I. A. Baumgartner and V. E. Larsen, all of Chicago, Ill.

3. That there are no bondholders, mortgagees, or other security holders owning or holding 1% or more of total amount of bonds, mortgages or other securities.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

V. E. LARSEN,
Business Manager.

Sworn to and subscribed before me this 27th day of March, 1929. (Seal)
JAMES A. SAWYER.

(My commission expires January 25, 1933.)

New Corporations

Adams Stone Products Co., George O. Adams, Treas., R. D. 6, Hanover, Pa. $40,000. To quarry limestone. Austin S. Storm.

C. C. Beam, Inc., Melvin, Ohio. 3000 shares n.p.v. C. C. Beam, W. V. Custos.

United Sand & Gravel Co., Canton, Ohio. 1000 shares n.p.v. William Timpe, David B. Day, M. L. McCann.

Jersey Gravel Co., Hamburg, N. J. $50,000 pfd.; 2600 shares com.

Warner Co., Wilmington, Del. 457,-Van Sciver Corp., Philadelphia, Pa.

Shore Acre Sand & Gravel, Jamestown, N. Y. $100,000.

R. L. Black & Co., Milton, W. Va. $50,000. R. L. Black, Milton; S. D. McGee, St. Albans; R. Kemp Morton, H. L. Snyder, Jr., D. W. Dunbar, all of Charleston, W. Va.

Quilt Stone Co., Columbus, O. $25,000 and 500 shares n.p.v. Samuel Ross, Herbert A. Haiser, Ernest C. Harriman.

Blue Creek Stone Co., Decatur, Ind. $10,000. Theo. W. Baker, John Hisey, Lee Boehm. Leased Blue Creek stone quarries mile west of Willshire, Ohio.

Elizabethton Stone Co., Elizabethton, Tenn. $20,000. To quarry stone. E. S. Koon, R. L. Moore, R. P. Simmons, Ben Allen, Roy C. Nelson.

Ohio River Salt Corp., Mason, W. Va. $50,000. To produce salt, calcium chloride, bromide. H. F. Smith, N. O. Wein, W. T. Stone, Hartford, W. Va.; A. F. Kisar, E. J. Somerville, Point Pleasant, W. Va.

Arnold Graphite Corp., Morgan S. Staples, Dallas, Tex. $15,000.

Beacon Sand & Gravel Co., Mt. Vernon, N. Y. 500 shares.

Central Jersey Sand & Gravel Co., Asbury Park, N. J. 10,000 shares n.p.v. J. Claude English, Isaiah Matlack, both Asbury Park; Elmer H. Geran, Matawan, N. J.

George H. McLeod Corp., Roslyn, N. Y. $100,000. W. E. Smith, Mineola, N. Y.

Hanover Sand & Gravel Co., Thomas G. Walker, 763 Broad St., Newark, N. J. 2,500 shares n.p.v.

Martin Marble Co., Batesville, Ark. $1,500. J. A. Martin, Battery Park Hotel, Asheville, N. C. Will develop marble deposits at Batesville.

Southern Feldspar Co., Bakersville, N. C. $50,000. J. A. Dunnis and P. B. Bullard, Keene, N. H.; Charles E. Greene, Bakersville, N. C.

Opens Branch In Pocatello, Idaho

The Idaho Tractor and Equipment Company has opened a new branch office in Pocatello for the distribution, in 19 southeastern Idaho counties, of equipment manufactured by the Caterpillar Tractor Company, and Holt-Combine Tractor Company, as well as Russell Road Machinery. Officers in charge of the Pocatello office are L. F. Cosgrove and H. R. Leonard.

Free Employment Service

Operators—

who are paid subscribers to PIT AND QUARRY and who desire to employ superintendents, managers, foremen, are invited to write us their specifications fully. Their specifications will be forwarded, without charge or obligation, to suitable applicants for such positions.

Superintendents, Managers, Foremen—

who are paid subscribers to PIT AND QUARRY and who are seeking positions, are invited to write us their qualifications fully. Their qualifications will be communicated, without charge or obligation, to those applying to PIT AND QUARRY for help.

Phosphate Rock Industry of Tennessee

Tennessee, since it passed South Carolina in 1899, has maintained its position as the second largest phosphate rock-producing state, ranking next to Florida. Tennessee phosphate deposits being worked at this time are in the west-central part of the state. Two types of rock are being mined, one being brown phosphate rock and blue phosphate rock. The brown phosphate rock is the residual weathered and leached outcrop of the phosphatic ordovician limestones which are exposed over a wide section of the southern part of the central basin of Tennessee, where the erosion of that basin in the summit of the Nashville dome has exposed the underlying ordovician phosphatic limestone. The so-called blue phosphate rock is a thin, unweathered highly phosphatic stratum of devonian or carboniferous (Mississippian) age occurring in the western part of the phosphate region.

The overburden of the brown rock phosphate is clay, and is removed; the large companies using drag-line excavators. Mining the brown rock is done by drag-line excavators whenever possible. Where the phosphate is thin or lies in narrow channels (cutters) in the limestone, so that it can not be mined by the drag-line excavators, it is mined by pick and shovel. The use of steam shovels and hydraulic methods for stripping or mining is no longer practiced. An electric shovel is used in mining a phosphatic filler near Nashville. The blue rock is mined by underground methods, drift mining by single-entry room-and-pillar system.

Much of the brown rock is washed. Lump phosphate rock suitable for furnace use, is either removed in the course of hand-mining operations or is taken out by screens in the early stages or washing. The washing process consists chiefly in first thoroughly agitating the phosphate-bearing material with water to disintegrate it, so that all the clay and fine sand are in suspension and separated from the coarse sand and lumps. Then follows the removal of the coarser phosphatic material by screening and the separation of the finer phosphatic grains from clay in mechanical or hydraulic classifiers. The wet rock from the washers is allowed to drain off excess moisture in outdoor storage piles and is then dried further in coal-fired direct-heat rotary driers. The blue phosphate rock needs only crushing and drying before shipment.

Whitcomb-Baldwin Alliance

The Baldwin Locomotive Works, one of the largest steam locomotive manufacturers in the world, has purchased a substantial interest in the business of the George D. Whitcomb Company, manufacturers of gasoline, distillate, oil, and alcohol burning locomotives, at Rochelle, Illinois.

The Whitcomb Company has now developed gas and oil electric locomotives up to the 100-ton sizes, and can furnish the railways locomotives with a maximum draw bar pull of 50,000 pounds. The Baldwin Locomotive Works has made an arrangement with the George D. Whitcomb Company to sell the Whitcomb locomotives and products in practically all foreign countries through its own representatives. An agreement has also been effected whereby the Baldwin Locomotive Works, through its domestic offices, will handle the railway field in the United States for the George D. Whitcomb Company.

INTIMATE NEWS OF MEN AND PLANTS

Rogers Appointed District Engineer

Ernest R. Rogers has been appointed district engineer of the Kansas City Office of the Portland Cement Association, according to announcement by Wm. M. Kinney, general manager of the organization. In this position he succeeds R. M. Simrall, resigned.

Since April, 1924, Mr. Rogers has been a field engineer in the Indianapolis district of the Association and previous to that time spent some nine years in the engineering corps of the Pennsylvania Railroad with headquarters at Ft. Wayne, Indiana. He studied civil engineering at the Wayne Technical Institute at Greenville, Ohio.

Boonville Sand Corporation Resumes Operations

After making necessary changes and repairs, the Sterling Creek plant of the Boonville Sand Corporation has resumed operations. This plant is located 6 miles east of Utica, New York, on the Utica-Herkimer highway, the New York Central Railway, and the barge canal.

Construction of this $200,000 plant started on April 1, 1928, and was ready for operation on August 1st. The plant has a 600-h.p. electric commercial power plant. It has a capacity of about 5,000 tons of washed sand, washed gravel, and washed crushed gravel (90 per cent crushed). The nature of the material is riverbed gravel.

The plant was designed by J. H. Wagoner, general superintendent of the firm. With the exception of the steel work, all construction work was done by the company's own workers. H. R. Beebe is president of the company, H. U. Owens is treasurer and manager, and C. A. Powers is superintendent at the plant. The company's main office is at Utica.

Ready-Mix Plant For Winston-Salem

The Concrete Supply Company has recently placed in operation a ready-mix plant at Winston-Salem, North Carolina. All material is fed into the mixers over weighing machines so as to eliminate any possibility of not having a uniform mix.

Not to Move Gravel Plant

Arrangements have been made with the Central Illinois Public Service Company to furnish electric power for its machinery enabling the Western Indiana Gravel Company to continue operating its plant at Metropolis.

The municipal power plant here was unable to continue furnishing power for the gravel company which faced the necessity of moving unless power arrangements could be made.

Gypsum Lumber Firm To Do Business Here

The Rockwood Products Corporation of Buffalo has been organized to manufacture gypsum lumber under a patented process owned by the Rockwood Corporation of America, located in St. Louis.

The company is expected to be in production by September. Charles L. Doelman, formerly vice president of Granger & Company, Buffalo, is president of the new company.

Other officers are: Byron F. Lyth, vice president; Stuart E. Sill, vice president, and John P. Taaffe, secretary-treasurer.

To Enlarge Plant at Sandt's Eddy

The Lehigh Portland Cement Company, at Sandt's Eddy, along the Delaware River, is making arrangements to enlarge its plant, so that double the present capacity can be obtained. The addition will cost approximately $2,000,000. The Edison Portland Cement Company, on the opposite side of the river, is completing several new mills.

Charles Warner and Van Sciver Combine

The Charles Warner Company of Philadelphia and the Van Sciver Corporation of Wilmington have merged, forming a new concern to be known as the Warner Company. It is stated the company will be one of the largest producers of sand and gravel in the United States.

The Charles Warner Company is the outgrowth of a business started by the Warner family in 1794 and operated since by five generations of Warners. It was incorporated in 1885, and controls the American Lime and Stone Company, the West Jersey Sand and Supply Corporation and the Cedar Hollow lime and crushed stone properties near Malvern, Pennsylvania. The Van Sciver Corporation was established in 1901 and incorporated in 1923. It controls the Knickerbocker Lime Company.

McCarney on Staff Of Silica Concern

O. A. McCarney, superintendent of the Argonaut mine for the past year and a half, has resigned to take charge of the Mt. Shasta Silica Company's operations at Burney, California in Shasta county. He is credited with having been largely responsible for making the Argonaut a profitable operation in the past year. W. E. Scott, foreman the last two years, will be in charge of mining operations there.

New Plant Will Make First Brick This Week

The Gem Stone Silica Company at Wehatchee, Washington, will start operating this week. The new by-products plant, with its new and modern equipment, has started operations.

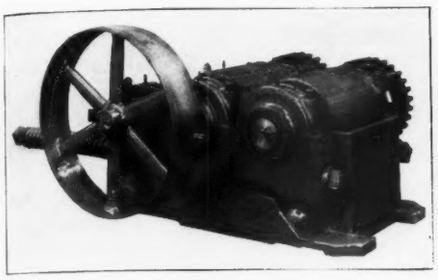
Work will start on the main plant in the near future, C. W. Smith, president, stated recently. It will be built of brick and materials manufactured in the new by-products plant.

The main tamping batteries in the by-product plant were installed at a cost of $5,000. These are being fed from a large mixer which handles about 15 cubic feet of raw material every 3½ minutes. All machinery is motor-driven.

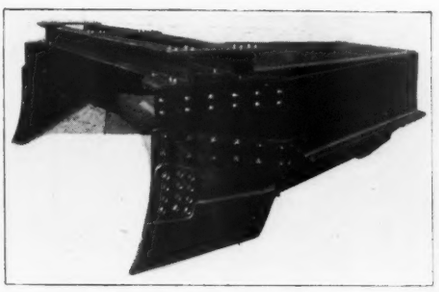
An experimental kiln has recently been completed with a steam furnace connecting. To begin with, this will be used. Most curing, however, will be done in the open air through the summer until early winter when six main kilns or curing chambers will be constructed to handle the product.

The new industrial plant is now ready to manufacture brick, fancy flooring, and everything known to modern building construction, as well as flower boxes and art lawn markers and decorations. The raw material comes from quarries ranging from Entiat to the Canadian line. Their quarry at Riverside is the largest zoisite quarry on earth. The rocks from these quarries are of pastel shades.

NEWS OF EQUIPMENT MANUFACTURERS



A New Roll Crusher



Six Yard Power Plow Scraper

Bucyrus-Erie Diesel Drag Shovel

New Crusher Designed

Butterworth and Lowe has just designed and is manufacturing a new crusher for abrasive materials which it terms the "Oliver" two roll heavy type crusher. It is for making comparatively fine crushing, starting with material ½- to 1-inch in diameter and rolling down to ⅛-inch. It is built either with smooth chilled rolls, or with corrugated rolls with interlocking corrugations.

The rolls are 18 inches in diameter with 18-inch faces, keyed and locked on taper shafts. The shafts themselves are 7 inches diameter at the large end with 5½ inch journals. All boxes are of split reversible and replaceable type for both roll shafts and drive shafts. The drive gears are course pitch semi-steel, driven pinion with one side shrouded.

Safe construction protects the crusher against tramp iron. The cast iron one-piece roll covering with flange for bolting on hopper drive pulley is 36 by 8 inches.

Approximate weight of the machine is 8,000 pounds. It is lubricated by means of the Alemite system. It has capacity at 100 rpm. to handle 3½ to 5½ tons of limestone gravel, crushing from ½- by 1-inch, roll set at ⅛-inch openings. The rolls are adjustable within limits.

Larger Scrapers Fulfilling Long Recognized Need

The advantage of a 6-yard scraper is, of course, that it handles more material. Figuring on a 200-foot radius, this scraper will deliver about 2,700 cubic yards per ten-hour day. With larger or smaller radius, this capacity varies proportionately.

You will note that the top brace is exceptionally strong to withstand the inward pressure from the ropes. The construction of the rudder nose which is clearly illustrated, shows the scraper in an upright position. This digging nose corresponds with the landside of a plow, which gives it its digging action and at the same time overcomes the tendency of the scraper to swing from side to side. It holds it on a straight course. The general advantages of the scraper shown, a Garst power plow scraper, is that it utilizes the plowshare principle in its digging nose.

The plow is the instrument that digs with the least resistance to line pull and because of this digging nose based on the plow principle this scraper pulls with considerably less line pull than the average scraper. Another feature is the cover or top plate. This top cover plate is adjustable and is very important because it permits the scraper to meet various conditions, such as change of power or different materials. It prevents over-digging as well as digging after the scraper has its capacity load. On under-water excavation, the cover prevents the load from washing out. This adjustable lid gives practically a 50 per cent variation in the load of the scraper. It digs only until fully loaded, after which the lid causes the scraper to rise and ride the surface, thus operating with a minimum line pull instead of digging all the way as does the ordinary scraper.

Rugged Simplicity Feature Of Diesel Drag Shovel

The new one-yard Diesel driven drag shovel announced by Bucyrus-Erie Company, Wisconsin, is easily convertible for use as shovel dragline, crane or clamshell. For the man who must use several different types of machines this equipment forms a very useful machine with extremely low fuel costs. It uses only 15 to 20 gallons per day of Diesel oil which costs 4 to 10 cents per gallon, depending upon the location.

The machine is built as simply and as ruggedly as is possible. The boom is of latticed channel construction while the dipper handle is a sturdy steel casting of I-beam section. The dipper, built with an extra heavy arch to take the thrust of boom and dipper handle, is built with long, chisel-shaped reversible teeth held in wedge-shaped sockets without bolts or rivets—teeth easy to replace and resharpen. The dipper is made with a marked flare to make it easier for the operator to cut a smooth wall and to cut the time required for dumping.

With standard 24 foot boom and a 8 foot 6 inch dipper handles, the machine has a maximum digging depth of 21 feet and a digging radius of 36 feet 6 inches. The clear dumping height for a front opening dipper is 10 feet 3 inches. The minimum dumping reach of the same dipper is 19 feet 6 inches, while the solid type dipper dumps between a radius of 17 feet and a radius of 30 feet.

M. C. Pohlkotte Joins Staff Of Allen Cone Company

The Allen Cone Company announces that Melvin C. Pohlkotte has joined its organization in the capacity of sales engineer. Mr. Pohlkotte is a university graduate in civil and electrical engineering and has done much practical work in the design, erection and operation of sand and gravel plants in the middle west and later in the Metropolitan district of New Jersey.

He will have charge of the engineering and research department of the company, which specializes in the settling and classifying of sands.

Matsen Company Moves Chicago Office

The Harry G. Matsen Company, 105 W. Monroe Street, Chicago, Illinois, has been appointed Chicago distributors of the Una Welding & Bonding Company, Cleveland, Ohio, manufacturers of Una Welding Machines and welding wire for both hand and automatic welding.

Koehring Full Shovel Has Striking Features

The Koehring heavy duty pull shovel is the latest unit added to the line of excavating equipment manufactured by the Koehring Company. Unusual features, which add appreciably to output capacity, are striking contributions in this Koehring to modern pull shovel design. These are (1) the shock absorbing principle in the boom base and in the dipper stick and (2) a specially designed jib frame providing a greatly increased working range and flexibility of operation.

The boom shock absorber is identical with that used on the Koehring shovel and in the same manner takes the twisting strains out of the boom and cushions the dipper when trimming the sides of a sewer trench. The dipper stick unit adds power to the digging effort by producing a gnawing action in hard, tough digging through the action of the powerful shock absorbing spring upon the dipper.

The boom is hinged to a separate casting which forms the base of the jib frame. The hinge point on all machines is six inches beyond the end of the multiplanes. This hinge point can be raised to a working position from 1 ft. 9 in. to 2 ft. above the turntable hinge pin sockets. Or, the hinge point may be lowered below the level of the turntable sockets to provide a maximum digging depth. The Koehring pull shovel is built in two sizes, equipped with ⅞- and 1¼-cubic yard dippers. Digging depths range from 17- to 24-feet.

Pangborn Expands

The Pangborn Corporation has taken over the goodwill patterns, records and drawings of the Universal Shot and Sand-Blast Manufacturing Company of New Jersey. Universal equipment, parts and supplies will now be manufactured by the Pangborn Corporation which is equipped to serve all Universal users. Robert E. Donnelly and Frank C. Weber, sole owners of the Universal business, are now associated with the Pangborn Corporation.

New Light Locomotive

After being handicapped for the past year on their smaller models due to inability in obtaining new Ford truck mechanism, the Brookville Locomotive Company is now offering a new light locomotive. The company claims this new model as being superior to any light locomotive it has ever produced.

A Light Locomotive

The Ford "AA" truck power unit is used. The drive wheels are steel-tired. An auxiliary reverse transmission offers the same speeds in both forward and reverse operation as offered by the Ford "AA" transmission forward, with speed reduction of 60 per cent as compared to regular road use speeds.

Corporation Changes Name and Distributes Announcement

The name of the American Spiral Pipe Works, which began operations the first year of this century, has been changed to Taylor Forge and Pipe Works as of March 30, 1929. The change, which is one in name only, has been made for the convenience of customers of the house, who were not wholly familiar with the wide range of products for high pressure service manufactured by the company. The artistic brochure gives a short history and reasons for the growth of the company and cites its effort to expand as demand presented opportunities.

A Vibrating Screen And Conveyor

The Traylor Vibrator Company is distributing a 4 page illustrated bulletin which describes the "Screen Supreme" and the Traylor Vibrator Conveyor. It also calls attention to the fact that motor generators are part of the standard equipment of these screens and conveyors and that operation may be obtained from any alternating current of standard specifications. Each motor generator is equipped with metal cabinet, rheostat for control of vibration and ammeter to guide the operator.

The screen is said to be exclusive in design, simple to operate and install, with no mechanical moving parts to cause excessive wear from abrasive materials, water, dust and lack of lubrication. No vibration is transmitted to the screen supports or building. The entire screen surface moves as a unit so that the screening action is identical at all points.

The vibrating conveyor is said to excel for short hauls, feeding and distributing problems. It is adaptable for feeds to crushers, screens, storage bins, distribution of storage material, loading cars and by-passing purposes.

Hercules Motors Corporation Completes Expansion Program

To provide adequate production facilities necessitated by the increased demand for Hercules Engines and Power Units, the Hercules Motors Corporation has recently completed a substantial addition to its plant. The new building as well as the new equipment is now in full operation and the company is turning out between twenty-five hundred and three thousand engines monthly.

It has been a long established policy and inflexible rule of the company that all engines must be thoroughly run in and tested by the most modern and accurate testing equipment available. Pursuing this policy, and in order to handle the increased production of Hercules engines, the testing equipment consisting of Sprague electric dynanometers has been more than doubled.

Bearings for Wheels And Shafts

The Timken Roller Bearing Company is distributing its 1929 edition of its catalog, "Wherever Wheels and Shafts Turn." It consists of 149 pages, many of them illustrated, handsomely bound and of durable and artistic appearance, which apparently will make a useful reference volume.

While it covers the general subject of the application of Timken Bearings, there are sections relating specifically to applications in which most engineers and operating men are interested. The book contains considerable data of interest and includes testimonial letters and advertising from large manufacturers which have adopted these bearings as standard.

Novo Announces Distributor

Clarence H. Buell, 404 South Clinton Street, Syracuse, New York, has been appointed distributor for the Novo Engine Company in the central part of New York state.